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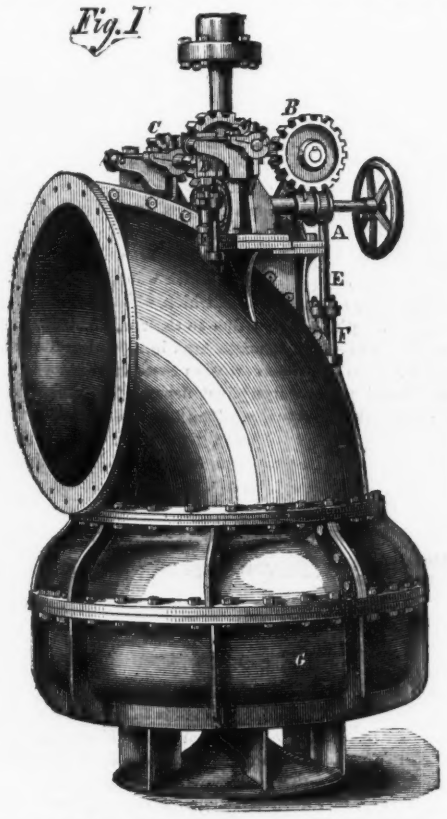
Swain's Patent Turbine Water-Wheel.

MUCH interest was manifested last summer by engineers, manufacturers, and others who use water as a motive power, in the competitive test of turbine wheels then being made at Lowell, Mass. No report has been made of the comparative merits of the half-dozen or more tests made, but we have received the report of H. F. MILLS, C. E., of his first series of experiments made there upon a 42-inch Swain turbine wheel, with diagrams of the entire apparatus, and description of the

Fig. 1



process, and tables of the results of ninety different experiments. There have been two other series of tests upon the same size of turbine, all of which have been more or less witnessed by the public and the highest authorities in hydraulic engineering. More than three hundred experiments have been made, comprising the most extensive and thorough series of tests upon hydraulic motors ever made public. The best result obtained in the first series was 82.2 per cent. of useful effect out of the total power of the water applied. The total useful effect developed on a working head of 14.225 feet was 62.81 horse-power. The highest result in the second series of tests was 83.7 per cent. of useful effect of the total power of the water 68.21 horse-power on a working head of 13.819 feet. We are informed that this wheel was an unusually rough specimen of its kind. We herewith present our readers with several perspective views of the style of wheel experimented upon, of which Fig. 1 shows the complete "cased" portable form; Fig. 3, the pedestal S, which supports the whole thing, and the gate J, step I, and chamber which surrounds the wheel with its wind, O Q, and socket O for the step I, and the floats R, as shown in Figs. 4 and 5. Fig. 6 shows the gate with its rods for raising and lowering by means of the hand-wheel and worm A; worm-wheel B, pinion C, rack D, and rods E, passing through the stuffing boxes F F, in the quarter turn, and these connecting with the above-mentioned rods, as shown in Fig 1. The guides M form a series of chutes, having a perfect contraction at all points of the opening of the gate, the water moving towards the floats of the wheel with an accelerated velocity in proportion to the opening upon the wheel. Fig. 7 shows parts in their proper position that are shown in detail in Figs. 3, 4, 5, and 6. Fig. 2 shows a style of casing adapted to situations where it is necessary to place the jack-shaft as near the bottom of the wheel-pit as possible.

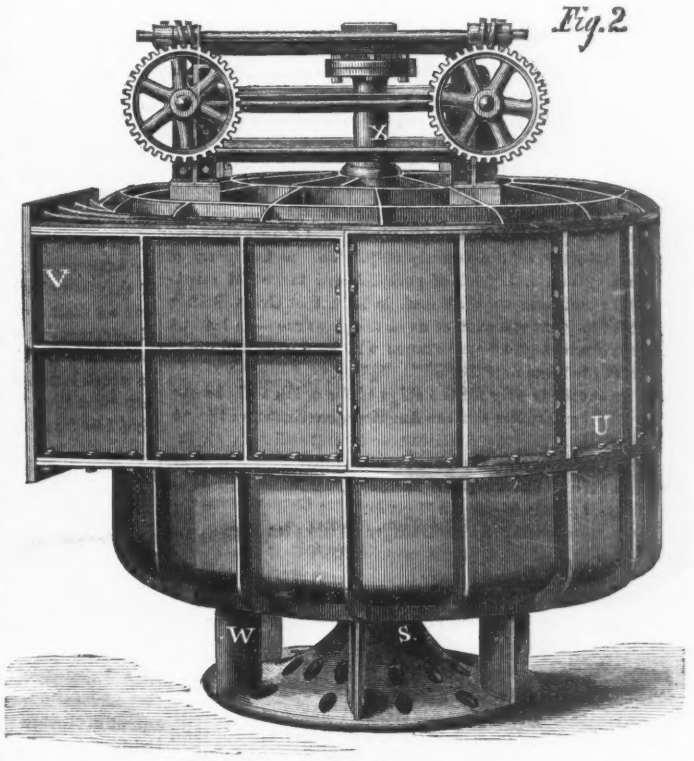
It is not claimed that the results mentioned are the highest ever obtained, as Mr. BOYDEN obtained on his improved FOURNEYRON turbine, a maximum of 88 per cent. of the power of the water applied. In his turbines, however, the workmanship was of the finest description, and of a delicacy and accuracy altogether unprecedented in constructions of this class, and "without much regard to cost." The SWAIN turbine, however, was built with a view to durability as well as economy.

The only series of experiments, given the public, upon the BOYDEN turbine, are to be found in "Lowell hydraulic experiments," by J. B. FRANCIS, & Co., and published by VAN NOSTRAND, New York. On pages 32, 33, 34 and 35, will be found the data and results of 92 experiments. The maximum result was at full gate, and 79.375 per cent. of the power of the water applied, and was conceded by engineers to be the standard motor hydraulic. Comparing the two turbines, with reference to the quantity of water used by each, when the gates are fully and partially opened, the following results were obtained:

Proportion of water used on each.	BOYDEN. Per cent.	SWAIN. Per cent.
Maximum	.79375, useful effect	.819 useful effect.
90 per cent	.750 " "	.810 " "
80 "	.700 " "	.795 " "
70 "	.650 " "	.767 " "
60 "	.560 " "	.717 " "
50 "	.440 " "	.650 " "

A substantial difference when it is borne in mind that all

Fig. 2



the dome has a telescopic appliance by which the extreme height of the dome can be extended to 24 feet, although the dome proper is only 18 feet high. The scow is securely moored over the rock, which it is intended to remove, by eight anchors, two of two tons each from bow to stern, and two lighter ones on each side. By means of four oscillating engines which are in the hold of the scow, each in a water-tight compartment, the dome, weighing over thirty tons, is let down over or on the rock. Eight rods or anchors are simultaneously crowded down by machinery, and securely hold the dome and prevent its swaying by the action of the tides. Across the well-hole, through which the dome has been lowered by the derricks, two bridges are thrown, and upon these is the drilling machinery. The drills are four on each bridge and one between on a smaller bridge connecting the two larger ones. The drills are each worked by means of a steam cylinder, seven inches in diameter and twenty inches stroke, which raises and drops a drill, a ponderous piece of steel, thirty feet long and three inches in diameter. The drills are worked through nine pipes, which are shored to the dome, and act as guides for the drills.

Fig. 3.

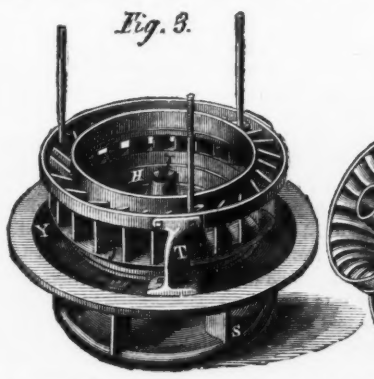


Fig. 4.

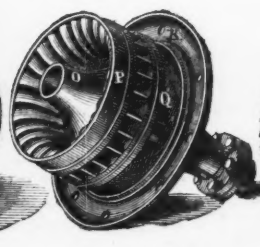


Fig. 5.

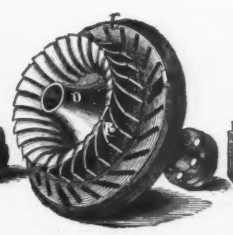


Fig. 6.

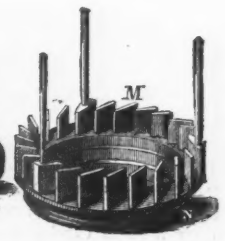
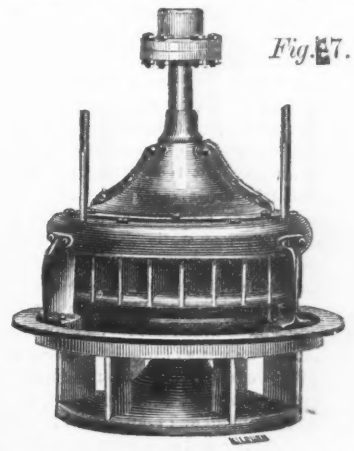


Fig. 7.



applied. In the third series the results at ¼, ½, ¾, ⅞, and full gate, and the relative working speed were as follows:

	Relative speed of the wheel.	Percentage of useful effect.
Full Gate	.745	.816
	.735	.819
	.706	.817
Seventh-eighths Gate.	.765	.815
	.754	.816
	.722	.818
Three-quarter Gate.	.769	.808
	.760	.811
	.726	.809
Half Gate	.736	.764
	.723	.770
	.697	.766
One-quarter Gate	.627	.613
	.592	.616

In this series, the maximum of useful effect developed was motors are subject to change of 10 and even 50 per cent. Further information can be obtained of the SWAIN Turbine Company, North-Chelmsford, Massachusetts.

Operations at Hell Gate.

INTERESTING engineering operations are now in progress at Hell Gate. The scow, built under the supervision of Captain Pearce for reducing the rocks at the Gate, where the tide runs with great rapidity, is finished, and the machinery has been placed on board, preparatory to making a trial. The scow is 129 feet long, 53 feet wide, and draws 3 feet 9 inches of water. In the centre of the scow is a well-hole, 30 feet in diameter; within this well-hole, hanging by four immense derricks, is the dome, made of the best and heaviest boiler iron. The crest of It is claimed that from two to four feet can be drilled by each drill an hour. Divers go down through the crest in the dome and see that the drills start right. The steam to work the drills, and the oscillating engines for raising and lowering the dome, is generated in a boiler which is housed on deck. Steam syphon-pumps are prepared to free the scow from water. The experimental drilling will probable take place within a week.

At present, experiments are being made with one of the drills on the rock at Hallett's Reef.—*N. Y. Bulletin.*

THE Telegraph Construction Company has leased the steamship Great Eastern for five years, to be used in laying submarine cables.

The Ship of the Future: Shall it be Wood or Iron?

A CONSTANT AND UNAPPREHENDED PERIL ATTENDING THE USE OF IRON SHIPS.

A Paper read by NORMAN WIARD before the Polytechnic Club of the American Institute.

THREE great nations are contending for the commercial and military supremacy of the seas, and for the carrying trade of the world—England, the United States, and France. While wood was the material from which ships were made, American citizens and sailors could boast of glorious victories achieved on each occasion when they came into competition with foreigners of whatever nation whether the trial was one of skill, strength, bravery, beauty of model or workmanship, speed, or carrying capacity, in peace or war. Our inventors conceived, constructed, and operated the first practical and successful steamboats; our citizens, sailors and merchants produced and utilized the first clipper lines of sailing vessels for long voyages; our yachtsmen won the first, and the last international matches with American built and rigged yachts; and our amateur sailors were the first to inaugurate yacht races across the wide expanse of ocean. Before we were recognized as a nation, our privateersmen made themselves a terror to the mistress of the seas, and contributed greatly thereby to our final success and independence. In our first national war, that of 1812, our sailors gained gallant and glorious victories on every occasion in which the enemy was met on anything like equal terms, whether on the great deep or the lakes. The great contest for the carrying trade of the world may be said to have begun about twenty years since between the United States and Great Britain; and during the first ten years our country had gained much upon her competitor. France then entered the ring, displaying some skill, energy and diplomacy, which, however, would have availed but little, had not our civil war withdrawn us from the contest for five years, and meantime thrown upon us not only the necessity of improvising a vast but temporary war navy, but also saddled upon us an immense war debt, of which we are so impatient that we are attempting to pay it off too quickly; thus making it a direct charge upon the present industry of the country only. To the five years of war we may add five years of political and industrial reconstruction; and thus we shall find, in 1872, that Great Britain will have ten years the start of us in the great race—in 1860 we were ten years ahead—and France will be "neck and neck" with us at the same date.

The great race is only for the ships of the ocean and the carrying between Europe and the American continent on the Atlantic, and between the American continent and Asia on the Pacific. For the latter, we have equal chances from this date; and undoubtedly our wealth of resources, and our aptitude in utilizing our means to ends, will give us victory on the Pacific. England may occasionally build a river steamer for France, but she will never build one for the internal waters of the United States, or for our coasting trade; and she could not compete with us in that direction, even if there was no legal restriction or tariff in the way. A line of English steamers put on the Mississippi, the North river, or the Sound, would simply be laughed at. We now excel all other nations in the quality of the production of our ship-yards for river and coast service; and we probably keep in employment a number of such craft equal to that of all the rest of the world. I deem it not improper to mention, in this connection, that the competition of government ship-yards, dry docks, and machine shops has much to do with the present depression of ship-building interest. A larger number of workmen are at this time employed in one government yard at Brooklyn, under the expensive and inexpert supervision of unpractical naval officers, and a larger cost of material is daily expended in that establishment, than would be necessary to man and supply all the private ship-yards in New York. Yet it is probable that one of our private yards, conducted as intelligently and wisely as private interests would dictate, under the supervision of its proprietors, who have long practical experience, not only in manipulating material and tools, but also in managing workmen, with one-twentieth of the number of men and five per cent. of the expenditure of cost in material, would produce more completed work in ships or repairs than is turned out at the Brooklyn Navy Yard. It is the conclusion drawn from long experience, that it is not every man who is adapted by skill and knowledge of human nature to succeed in manufacturing or commercial enterprises; where one succeeds, ninety-nine fail. The government has no skill as a manufacturer whatever; the government manufactures must, of necessity, be produced at from ten to twenty times the market price; and while the government continues to build and own its own ship-yards, dry docks, machine shops, and foundries, if the depression in ship-building for commercial purposes continues, private capital and enterprise will turn away from a business which has for its only customers a corporation possessing unlimited capital to invest and expend, and performing its own work in its own establishments.

The government work of building and repairing, distributed among the private yards and foundries at this time, might prevent the final closing and abandonment of many of them, so that we may have a nucleus for the new era. Commercial firms would not think of erecting docks, ship-yards, and foundries, for the purpose of building and repairing their own ships; and such firms might do so with better propriety than the government. There can be no progress in the way of improvement of the designs of ships, engines, boilers, etc., under government supervision in government manufactories. Workmen cannot be chosen for the work in government yards and factories with judgment, or, in fact, with due regard for their skill, because political influence now is, and always will be, the lever foisting men into position in the national ship-yards. During the war, a young friend of mine, who had served as a soldier, asked me to assist him to get employment at one of the navy yards, which I consented to do, as I considered him worthy. He had previously been in a responsible position as clerk to a revenue officer. I supposed the employment he would ask for would be consistent with his experience, and I procured letters from an eminent editor and two members of Congress for him, with which he went to some of the magnates of the yard. He succeeded in obtaining employment.

It was a year before I saw him again, and he then told me he had been all the time employed at the yard. I asked what he was doing, and he replied:

"Calking."

"That," said I, "is a new employment for you, is it not?"

"Yes," he answered. "When I went over to the yard I was referred to the foreman of the calkers, who said he thought he could set me at work next day. After a little friendly chat, he asked me if I had ever worked at calking. At first I was a little staggered; but then I remembered that I had once been employed in DEARBORN'S bottling establishment, putting corks in bottles, and I said I had, when he told me to come on next morning. I did so, and was set at work."

"How did you get along?" I said.

"Oh, I got along as well as any of them. I didn't do much for a week or two, but just watched the rest of them; and after that it was all right. The fact is, I didn't know what calking was when I went there, or I wouldn't have answered as I did. Perhaps if I had known better I wouldn't have got the job."

The fact is, gentlemen, that Government workshops, in their effect, general and private industries, are much like the public poor-houses or State prisons; and you will concede it is a sad condition for any business to be in, when ninety-five per cent. of all the skilled labor employed is in the poor-houses or State prisons, and when their convict and pauper labor comes in competition with the local manufactures of the neighborhood. It is my hope that Congress will entirely abolish all the navy-yards, dry-docks, foundries, machine-shops, public printing-houses, armories, engraving and book-binding, and manufacturing establishments now owned or operated on Government account; cause the Navy, the Army, and the Treasury to go out of the manufacturing business, which they do not understand, cannot learn, and would not practice with economy if they were skillful; and also decree that the establishments and all their appliances shall be sold at auction, and when the Government wants any manufactured article, let it be procured from skillful makers of the article, who do understand the art to which it relates, and from the person or establishment that will make it of the best quality for the least money. I confess that I believe that all the branches of trade connected with ship building are so depressed by the long-continued competition with Government factories, (untaxed, while the private artisan has been overloaded with all kinds of imposts); that if we would quickly restore the trades to activity, we must have complete relief from taxation in addition to the removal of Government competition. I know there are persons who think subsidies to special lines of mail steamships a remedy for the ills we bear. But the unblushing impudence of political tricksters would secure all the benefits of such a policy. The Government would not think of granting subsidies to any lines now established, as a help to the ship-building interest; and whenever it seems probable that Congress will be disposed to grant a subsidy to any new enterprise, fictitious companies, without a cent of capital, managed by politicians and schemers, who never owned or built a ship, and who never will, will gobble up all the benefit to be derived from the good-will of our legislators.

The truth of the proverb, that "Providence helps them who help themselves," has been singularly verified in the past history of the material progress of this country; and upon the energy and genius of our people, exhibited, as it will surely be, in the future, we must principally rely for re-establishing our supremacy on the seas and in our ship-yards. The ship of the future will undoubtedly be fast, strong, and durable. If fast, it will be long; and as we increase the length without proportionate depth and width, we require either stronger materials or more skillful construction and workmanship. This consideration has undoubtedly had much to do with making us think that we must use iron for ships' hulls, principally from the mistaken notion that for equal weights iron is strongest.

A given weight of oak has a greater average and more reliable strength than an equal weight of iron. It is only in its lesser bulk that iron can have any conceivable advantage; and for large ships, the plan now adopted being that of making them with a double skin, *i. e.*, having one ship inside another, wood furnishes equal strength and solidity for equal bulk. *i. e.*, equal room for freight for equal displacement of water. The best wrought-iron is about seven times as heavy as seasoned live oak, while it is only about five times as strong.

If it were the fact that the ship of the future is to be of iron, there would be left us but one course to pursue, in order to regain the ocean ship-building and steam carrying trade of the great Atlantic, namely, war—a war with England. We can never hope to excel or even equal England in building large and swift ocean mail steamers of iron. I am not here, however, as the advocate of a war with England; for I do not believe that the ship of the future is to be made of iron. I prefer to take the weather-gauge of the English ship-builders, by assisting to discover how to make a better ship of the material we have in like excess to the English supply of iron—to take the wind out of their sails, as our yachtsmen did the other day. And this I propose to do, by inquiring into the bad qualities of the ships they produce, and by investigation in advance to find out how to produce a better ship than they can make without coming to us, or applying to some foreign country for the material.

If iron is the best material for ships, why do they not build their yachts of iron, and thus beat us in the international matches? The reason is, that an iron bottom gets foul, and when covered with barnacles and excrescences, cannot be so well forced through the water. Speed is one of the most important qualities, next to buoyancy, which a vessel can have, whether she is to be propelled by the wind or by a steam-engine. A wooden hull admits of sheathing with copper or yellow metal, which keeps clean and smooth, and thus retains its speed. Iron cannot be so sheathed, because galvanic action is excited, which so hastens corrosion that an iron ship covered with copper or yellow metal would be entirely destroyed in a few months. Even with frequent hauling out and repainting, a material part of the average speed of all iron ships is lost on account of the unavoidable foulness of their bottoms. So serious has this evil been considered, that plans have been devised for covering the whole surface of the hulls of iron ships with wood, for the sole purpose of insulating the ships from the sheathing of copper. In fact, even English ship-builders have, from time to time, held that it was impracticable to build iron hulls for iron-clad ships on that account; and in pursuance of that idea, most of the large English iron-clad ships have had wooden hulls, upon which the heavy iron armor was placed.

The strains to which a ship is subjected are different from those of most other structures, being similar to the strains upon a beam, with its load disposed upon its whole length, while its supports are shifted irregularly from the ends towards the middle of its length, and *vice versa*. A ship, therefore, requires great strength to resist transverse rupture. The large proportion of width to length of the sheets of which an iron ship is made, gives to each section of the hull a large proportion of transverse seams or riveted joints. These are lines of weakness, since such seams have but little more than half the strength of the sheet elsewhere.* It is an axiom of mechanics that "all structures are only as strong as the weakest part;" and as these butt-seams are in the transverse direction to the keel, and in the direction of the tendency of the ship to break, it can be seen that it is necessary to put nearly twice as much iron in the plates forming the skin of an iron ship, as would be necessary if the whole skin could be made either of one plate or of strips of iron reaching from stem to stern. Happily, the trees from which we cut our ship-timber for wooden ships furnish planks which, although narrow, have such great length, in proportion to their width, that we need not consider the loss of strength from butt-joints. To keep an iron ship in repair against corrosion costs more than to keep a like wooden ship in repair against decay. The corrosion cannot be prevented effectually. The latest discoveries in relation to the preservation of wood give reason to hope that the wood of ships may be preserved for a much longer useful life than iron. The iron, too, decays most rapidly in the most inaccessible places

It is asserted by the advocates of iron for ships, that iron ships may be built by machinery, thus reducing the proportion of manual labor required. The amount of manual labor required to build an iron ship, even when aided by machinery and labor-saving inventions, far exceeds the amount required for wooden ships unaided by machinery; and the manufacture of wooden ships almost entirely by machinery is quite possible. In fact, it is easier to conceive the adaptability of machinery to the building of wooden ships than to those of iron.

Nearly all the strains to which a ship is subjected having the tendency to transverse rupture, the frame adds but little to its strength.† Improvements in the mode of construction of wooden ships may, and will undoubtedly, be made in the direction of utilizing all the strength of the oak in the hull. For instance, we might make the frame of plank of double thickness, laid diagonal to the keel, like the iron diagonal braces sometimes used; and these frame-plank might then be strongly tree-nailed at each intersection. If the wood of such a frame should be preserved by antiseptics, and then well painted, it would last longer and be stronger than any iron frame of equal weight, while the cost would be much less. A lining and outside planking then put on such a frame, to make a whole thickness of fourteen or sixteen inches of preserved wood, all carefully painted, inside and out, would make a hull which, if supported by orlop decks and longitudinal and thwart-ship bulk-heads, as an iron hull must be, would be stronger by far than a double-skinned hull of iron with inner and outer plates one inch thick each on the average, and with a frame which would have equal weight to the plates, making altogether a weight equal to twenty-eight inches of solid wood. The inferior weight of the wooden hull might be made up by increased depth, by which the wooden hull would be greatly increased in strength over the iron hull.

But it is in the fact that wood does not expand and contract by changes of temperature, that we find its peculiar advantages as a material of which to build ships, especially steamships. We may learn from MILLER'S Elements of Chemistry that "the amount of force exerted by expansion or contraction from the effects of heat or cold is enormous; for it is equal to that which would be required to elongate or compress the material to the same extent by mechanical means." I have fre-

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* In FAIRBURN'S "Iron Ship Building," we find, page 40: "We may assume the following relative strengths as the value of plates with their mitred joints:

Taking the strength of the plate at..... 100.
The strength of the double-riveted joint would be..... 70.
And the strenth of the single-riveted joint..... 56."

† Mr. WILLIAM FAIRBURN, referring to the strains upon iron ships, says: "The maximum strain of a ship afloat appears to take place when she is supported on the crest of a wave—*as represented in Fig*, 2. Dr. RANKIN has determined this strain to be one-fifth of the ultimate strength of the material. Now it must be borne in mind that this apparently small strain on the material may assume the form of a destructive force when it is alternately laid on and taken off for an indefinite number of times, especially when it is considered that these strains are first in one direction and then in another; that is to say, the material in the top section (the weakest part of the section,) is at one time in a state of tension and at another in a state of compression."

quently presented before this association my views in relation to these phenomena as affecting other structures of iron; but the importance of their bearing upon the question of the best material for ships is so great, that I hope you will have patience with me if I refer to them again, and endeavor to show that the force of expansion and contraction from changes of temperature is the one force acting to destroy iron ships, most difficult to provide against by any known mode of construction, and most liable to cause the unexpected destruction of the ship, human life, and its cargo, so that neither can ever be heard from again.

"According to the experiments of BARLOW, a bar of malleable iron of a square inch of section is stretched 1-10,000th of its length by a ton weight suspended by it; a similar elongation is produced by about sixteen degrees Fahrenheit. For a variation of temperature of eighty degrees, a wrought bar of iron ten inches long will change its length 5-1,000ths of an inch; and will exert a strain, if its two extremities be securely fastened, equal to fifty tons upon the square inch, or twice its tensile strength. Calculating upon JOULE'S data, it may be estimated that the force exerted by heat in producing the expansion of one pound of iron between 32 and 212 degrees, during which it would increase about 1-280th of its bulk, would be adequate to lift a weight of 7 tons to the height of one foot, or 1,344 tons one-sixteenth of an inch high.

During the war, it was common for the iron hulls of our monitors to break at the bow and stern, just at the overhang. Some of these ruptures were thirty feet in length; and it was usual at the time to attribute the ruptures to the blows given by the seas under the overhang. But when it is remembered that the wooden backing under the armor-plates covered two or three of the top-courses of plates forming the sides of the hull, so as to prevent contact with the water, and if we take into account the great heat below decks in that class of vessel when at sea (the thermometer sometimes standing at 140°), it can be seen that there was a force acting to break these plates much more potent than the pounding under the overhang, namely, the force of unequal expansion to which I have alluded.

The first monitor went to the bottom of the Atlantic, on account of such a rupture. The hull of the "Weehawken" broke in the same manner, under the overhang, and went to the bottom with four officers and twenty-seven men. She sank so suddenly that the persons lost, although hastily warned, could not escape to the deck. No one would claim that there was any pounding by the seas under the overhang in this case, as the "Weehawken" was in harbor; but she had steam on, and had just closed her hatches to keep out the slight sea which was then rising, and beginning to flow over her deck. When the hatches were secured, she heated up below. Her deck was then contracted, from losing some of its previous temperature, as the water began to flow over it. This would cause ruptures at the bow and stern to yawn, and admit the water which sunk her. At some time or other, the reports show that every one of the monitors with iron hulls separated at the bow or stern, by breaking away from the overhang; and when the Department, having full knowledge of this difficulty, contemplated building an improved class of monitors, they did not build them of iron. The monitors with wooden hulls were supplied with an overhang. They, too, had to encounter rough seas, and were liable to pounding; but none of them ever leaked under the overhang.

An iron ship, five hundred feet long, would have her length increased six inches by an increase of temperature of one hundred degrees. If her hold, containing boilers, had a temperature of one hundred and thirty-two degrees, and upon approaching an ice berg her bottom should be reduced to thirty-two degrees, and if she had five feet of sheer, her deck would be straightened, and her bow and stern would be depressed about five feet. Her whole weight, resting on rocks at the bow and stern, would not strain or bend her one-quarter so much. If she had an inner skin, that is, a double bottom and sides to her hull, the outside plates would be strained by a difference of temperature of eighty degrees, about fifty tons to each inch of area of cross-section of her plates. She could not stand half so much, even if she had not her own weight to sustain. The best naval architects design their ships in such a manner that no part of the iron shall be subjected, in any contingency, at sea or ashore, to a strain or tension greater than five tons to the square inch of the iron; and when the weakness of the riveted joints is considered, it can be seen that no more should be expected of the best iron or the best workmanship. According to the authority I have heretofore referred to, a change or difference of temperature of sixteen degrees would subject the outer plates of a double-skinned ship to an additional tension of three tons to the square inch of the iron. Such a ship, in a heavy sea, with hatches down, might, it is easy to conceive, have all her interior heated to one hundred degrees. If she should approach the neighborhood of an ice berg, which would cool the water near it perhaps to forty degrees, while she was subjected to the strain which would arise from being supported alternately by the middle of her length or by seas under her bow and stern, (a strain, say, of five tons to the inch of section,) the additional strain, from her unequal temperature, would break her in two. Many ships have gone down at sea with all on board, and have never been heard from. Who can tell that the "City of Boston" was not broken in two by this heretofore unapprehended force? No word of explanation has ever come from any on board, or ever will. Let the English ship-yards turn out their iron hulls, while we busy ourselves with teaching the unsuspecting traveller the perils he encounters when he takes passage on them. Let us meanwhile go to work and devise how best to preserve wood from decay when formed into the hulls of ships. Let us increase our supply of live oak for the purpose, and contrive how to construct the frames of ships so that they shall be best able to resist the strains which cause transverse rupture, and employ our ingenuity in contriving improved boilers, engines, and wheels, so that, with our handsome models, coppered bottoms, and well-applied power of single engines, we may attain speed which will shame our English cousins. Then we need not care for subsidies, mail contracts, or the removal of taxes. We shall have produced the ship of the future, which is to carry the passengers and transport the freight of the future. I hope, and believe, it will be built in the United States, by American artisans, and manned by American sailors.

The San Jacinto Tin Mines.

THE following extracts are taken from a letter addressed by Mr. E. N. ROBINSON to the members of the House of Representatives from the State of California:

It is only within the past year that we have convinced ourselves, beyond a doubt, that we have within the boundaries of our own country tin deposits of great magnitude and of unparalleled richness.

The San Jacinto tin mines of California have been opened and developed to such an extent, that thousands of tons of first-class tin ore lie in sight, ready to be broken down when the necessary machinery shall be erected for stamping and working the same.

I have personally attended or supervised the opening up of this property, and can speak understandingly about the matter. I have caused to be extracted and worked a considerable quantity of the ore, and can show, as the result of my labors, several thousand pounds of American tin, in pigs or bars, and of the very best quality, a sample of which (weighing 82 pounds) will be laid before you in a few days.

This industry is a new one, and promises to be a source of great importance and wealth to the United States, *provided* the present tariff on tin metal is not changed to the free list, as suggested by Mr. KELLY, who undoubtedly labored under the impression that tin ore, in paying quantities, did not exist in the United States, and under the same mistake the majority of the Committee of Ways and Means have reported an increase of about 100 per cent. on *sheet* tin, while tin in *pigs* or *bars* is put into the free list.

This increase on sheet tin is not wrong or unjust, for it necessarily benefits our home iron interests; but you must certainly recognize how our tin interest (now in its infancy) will be sacrificed if pig tin is placed, as suggested, on the *free list*.

If you will carefully peruse the following exhibit, you will see how positive is the necessity of protecting *our own tin*, by a just and fair tariff on the raw material.

In the fiscal year ending June 30, 1868, the imports of tin to the United States were as follows:

Sheet tin	$5,750,000
Pig	2,750,000
A total of	$8,500,000

while last year, up to June 30, 1869, the imports amounte1 to $10,300,000, divided as follows:

Sheet tin	$7,000,000
Pig tin	3,300,000

The present duty upon *tin plates* is 25 per cent. *ad valorem*, and it amounts to 1¼ and 1½ cents per pound. On pig tin it is 15 per cent., and on manufactured tin 35 per cent.

Why not raise the duty on sheet tin as proposed, to 2 ¾, and at the same time add 10 per cent. to the pig tin? For the effect of protecting our American tin will be the same as that proposed by Mr. KELLY, as regards nickel, namely, it would force skilled tinmen with their labor and capital by millions, on to our tin lands, and thus furnish a large number of people to consume our grain and other products, and by thus increasing the duty on pig tin from 15 to 25 or 30 per cent., you will make the United States the great tin-producing country of the world.

There is no form of metal which serves as raw material to so many skilled manufacturers.

China consumes a very large quantity of the metal. One port alone last year imported 6,500 tons. That we will feel the benefit of the China trade, there can be no doubt, so soon as we commence to produce, and if the tariff is of a protective nature, the day is near at hand when American tin will be thrown in quantities upon the market.

With the exception of several boxes made during the last few months in California, there has never been a tin plate made in the United States of strictly American tin.

That sheet tin can be made in the United States, and from the products of our own mines, I can, and have proved beyond a doubt. A report in reference to the condition and extent of the mine herein mentioned accompanies this, and if you will peruse the same with care, you can convince yourselves that there is no reason to doubt our ability to furnish all the tin that the United States may require for the present, and in a short time be in condition to export our metal to those countries from which we have for so long a time drawn our supply.

The report of the San Jacinto Company, to which Mr. ROBINSON alludes in the foregoing paragraphs, is before us, and we extract a few statements from it. The Superintendent says:

Upon my visit to the mine, on the 28th of March last, I found the entire force at work on the one hundred foot level, and all hands highly elated with the appearance of the vein there; standing at a point, on this level, near the foot of the "main shaft," all the ore south, at this depth, contains a fair per cent. of tin, the ledge averaging three feet in width, while the ore south of the "main shaft," in the "adit tunnel" above, would show but traces of tin, the vein, however, having all the indications of tin at depth.

Going north in the lower level, the vein was fully as rich as any portion of the mine above for a distance of one hundred and ninety (190) feet, when the vein commenced to narrow, and at a point two hundred and forty (240) feet from the shaft, the vein was but three inches wide.

The lower level has been opened up to the first of June three hundred and ninety-six (396) feet, exhibiting an average width of three (3) feet, the assays of which I have not yet received from Mr. WILLIAMS, on account of his illness. The samples of ore in my possession, not selected, taken from the south drift in March last, assay eighteen per cent.; the width of the vein between the two levels will average four feet at the smallest estimate; assuming the vein to average only three feet in width, you have a mine that at present can be made to yield as follows:

Length of ore strata on Adit Tunnel	225 feet
Length of ore strata on 100 foot level	275 feet
	500 feet
Showing an average length between the two lines of	250 feet
Average width of vein	3 feet
And the distance between levels being	65 feet

250 x 3 x 65 equals 48,750 cubic feet of ore, which, at 13 feet to the ton, shows as standing in the mine, at the present time, three thousand seven hundred and fifty (3,750) tons of ore, that will average sixteen per cent.; every pound of this ore can be placed on the dump, without any extra or new machinery, and the cost of mining, as estimated by Mr. WILLIAMS, in the following letter, will not exceed fifteen dollars per ton, laid on the dump, or a total of fifty-six thousand two hundred and fifty ($56,250) dollars.

Upon these and other data, he predicts the following as to cost and profit:

Mining 3,750 tons at $15	$56,250
Crushing 3,750 tons at $2 75	10,350
Concentrating up to 60 per cent. at $2	7,500
Transportation of 1,000 tons, 60 per cent. concentration, to San Francisco, at $25	25,000
Smelting same in San Francisco at $75	75,000
Thus an expenditure of	$174,000

will furnish from three thousand seven hundred and fifty tons of ore, six hundred tons of tin,

Worth at 40 cents per pound	$480,000
Or a net profit, of say	305,000

on the ore now in sight, or about $80 per ton net profit on the ore as it now stands in the mine. As a total cost, I think my estimate a safe one for mining, reducing and putting into pig metal the ore now in sight, for I am confident I have overestimated very largely the cost of extracting the ore from the mine at $15 per ton; and if I have under-estimated anywhere, it is in the cost of smelting at $75. I am not sufficiently acquainted with the process to speak understandingly about it, and have to depend upon what is told me by persons who, I am assured, understand the business thoroughly.

A subsequent calculation, based upon the hypothesis that the ore may yield only 5 per cent., instead of 16, still gives a profit of twelve dollars per ton.

Letter from Mr. A. Mezger, M. E., on the Calcasieu Country, Louisiana.

TO THE EDITOR—Sir: I have been here about a month without having been able to commence work. You have been too long connected with the mining industry of America to be at all surprised, when I tell you that the litigation now pending in New Orleans in regard to this property takes up entirely the attention, and what is worse, the funds of the company, so that it is impossible for me even to make a start. The suit belongs to the "*causes celèbres*," and the best lawyers are engaged on both sides to fan the flame instead of extinguishing it; and this state of affairs is so much the worse, as experience tells us that it is wholly out of the question to predict the end of the strife. It is conducted with such animosity on both sides as to preclude all hope of a compromise; even if proposals to that effect should be made from either party, they would probably not be accepted by the other. * * * I came here by way of Galveston, on a schooner. The bar at the mouth of the Calcasieu river has on an average four feet of water. The river itself is twenty and more feet deep up to Lake Calcasieu, which has an average depth of six or eight feet. On its southern extremity it has, however, only two and a half to three feet of water, so that only vessels of very light draft can navigate it. The banks of the southern part of the river are flat and very thinly settled. The shores of the lake are swampy and entirely uninhabited. In the northern end of the lake a few cultivated islands are scattered among a number of cane-covered ones, and a few which consist entirely of shells and are bare of vegetation. The next following part of the river is frequently lined with fine forests and scattered saw-mills; and here the otherwise dreary and monotonous aspect of the country is somewhat enlivened by farms. Next, several small lakes are passed, and through dense cypress woods Lake Charles is reached—a lake which is the centre of a beautiful landscape. The town of the same name looks dilapidated. Its main industry is connected with the sawing of lumber; ship-building is rather in its infancy; the newspaper published here is a weekly and has about three hundred subscribers. The languages used are French and English. Vegetation: pine, cedar, cypress, live-oak, red-oak, black-jack, mulberry, blackberry, climbing vines, etc. Agriculture is not very flourishing, and is limited to the raising of a little cotton, corn, oranges and sweet potatoes. * * * The country from Lake Charles to this place is flat; the greatest difference of levels is hardly more than thirty feet. Most remarkable in this region is the existence of small hillocks of from two to four feet in height and a diameter of from six to thirty feet, which must be numbered by thousands. I am as yet unable to explain this phenomenon satisfactorily. The soil consists of sand and loam, and the hillocks seem to be made up of the same materials. I shall be better able to give an opinion as to their origin after having dug through some of

them, but at present the simplest reasoning seems to teach us that they belong to our present period, and are, so to say, due to daily changes of the surface. Subject to the Southern rainstorms, they cannot, I should think, last longer than a century, the more so as they consist of material which resists atmospheric influences in only a slight degree. It is at any rate certain that these hillocks must owe their origin to such or similar causes, and not to animals. It might also be supposed that they are the former craters of gas-springs, the more so as the country is full of these at the present time. But it is useless to speculate, and I will reserve an opinion until I am better able to give it.

The road along the west fork of the river leads nearly due west for some distance, and then turns south and leads you finally into a swamp, which extends for miles. In this swamp is an island of about eighty acres; this is the locality so much talked about of late, in which a bore-hole was commenced for the purpose of finding petroleum, and which resulted in the discovery of a vast sulphur deposit.

The original cause for the boring of this hole I have never seen mentioned publicly; but the existence of eight or ten dried up oil springs, indicated by small deposits of asphaltum, and besides this, a supposed or real film of oil on the surface of the swamp, furnished undoubtedly the first impetus. Several small shafts were sunk to gather the oil, but its quantity was insufficient. There is, however, still one spring which furnishes constantly a thick black oil, gathered by a few inhabitants of the district and used for lubricating purposes.

As in most cases in this country, an official boring journal is wanting, and the remaining chips and the sand-pump dump furnish little light. The surface in the neighborhood of the bore consists of clay and sand, and with the addition of limestone particles, nothing else can be found in the refuse from the hole. The water now running out of the latter has been struck above the sulphur bed, according to the report of the workmen, and the quantity now issuing per minute is at least one hundred and seventy to one hundred and eighty gallons, instead of sixty-five, as reported by Professor HILGARD. It is saturated with sulphuretted hydrogen and carburets. Besides these gases, it contains chloride of sodium, magnesium and sulphates. An oily taste of the water cannot be mistaken. At a distance of about one hundred and fifty yards west of the hole are several gas-springs, some of which emit constantly and others periodically, sulphuretted and carburetted hydrogen. At one of these regularly intermittent periods of one minute and twenty seconds can be observed.

The gases are all combustible, and you may judge what a fine prospect for explosions I will thus have in sinking the shaft. My windows open on the part of the lake into which the water from the bore-hole flows. Sulphur is secreted from it, and the whole visible part of the swamp has thus assumed a decidedly yellow color. In spite of this, I have the pleasure of watching every day several young alligators, who sun themselves in this part of the swamp and, as the first guests at the sulphur baths, thrive wonderfully. * * *

As soon as a change occurs in the aspect of affairs at this place I shall advise you. A. MEZGER.

OIL SPRINGS, Calcasieu Parish, La., May 10th, 1870.

A New Gunpowder.

THE *London Globe* says: "Great advantages are expected to follow the employment of the new powder recommended by the Committee on Explosives for use in heavy guns; and we understand the gunpowder manufacturers are pricking up their ears at the possibility of large foreign and colonial contracts. It is even said that Messrs. Curtis and Harvey, the enterprising manufacturers of Hounslow, have already adapted their machinery for the production of special powders of this class. The new gunpowder—termed "pebble," from its resemblance to ordinary black pebbles—differs principally from the present service powder in size of grain and density; the introduction of such a powder will consequently involve but little departure from the existing system of manufacture, and supply in large quantities will be attended with little difficulty. The powder will be produced by breaking up "press cake" of a density of 1.8 into lumps, which, in the sifting process, are retained on sieves of 5.8 and 4.8 inch mesh. The advantages claimed are as follows: 1. Equal muzzle velocity to that given by the present service powder, combined with a material reduction in the initial strain exerted by the exploding charge. Thus, without any sacrifice of powder, the life of the gun will be prolonged, and the risk of accident diminished. 2. The reduction of violence of explosion effected by the use of such powder will diminish the liability of projectiles breaking up in the gun, and modify the scoring action of the gas on the surface of the bore. 3. The powder being harder and of greater density than that at present in the service, will stand the wear and tear of transport better, be less liable to dust, and altogether be superior in keeping properties. 4. It is probable that by the use of large charges the power of our armaments may be considerably increased with safety. It is difficult fully to appreciate the immense advantages thus given to gunnery. The size of our monster guns has hitherto been practically limited by the powers of withstanding the enormous charges necessary to propel heavy projectiles; the defence has thus got slightly in advance of the attack. With our present knowledge, however, of gunpowder, most of the difficulties will disappear, and we should be happy to hear that the royal gun factories had received an order for a 1000-pounder of 50 tons."

Skilled Workmen Coming to America.

SEVERAL English journals express great regret at the exodus of vast numbers of skilled artisans from London to this country. About two weeks ago, over eight hundred men, principally the employees of ship-building establishments, left the banks of the Thames in a body for this country. No one can call in question the utter collapse of the iron and ship-building trades of the Thames. Half a dozen years ago the banks of that river were alive with iron-works, ship-building establishments, and other industries more or less directly connected therewith. At this time it is hardly possible to imagine a greater contrast than the same locality presents. As to iron manufacturing operations or ship-building work, there is scarcely anything going on, as compared with the activity which prevailed a few years ago. At Mill Wall a large establishment is absolutely in ruins. Numbers of ship-building yards show only a wreck of a departed industry. At Black Wall the Thames Ship-building and Engineering Company are at work, but their operations are on a far less extensive scale than is represented by the capabilities of the establishment. The steel-works of BESSEMER BROTHERS are being dismantled, and the machinery is about to be transferred to a new establishment in South Staffordshire. The ship-building yards, which once turned out a large tonnage of iron vessels, are now so nearly paralyzed that perhaps not over half a dozen small iron vessels are now in course of construction upon the river. The closing of Woolwich Dock Yard also adds to the depression of trade upon the river. The industries to which we have alluded have no doubt been permanently driven from the Thames. At the same time they have been developing with remarkable activity upon the Tyne, Tees and Clyde, owing to the lower cost of iron, coal and all other materials entering into the construction of iron ships. Wages are also lower in the northern rivers than near London. In speaking of the emigration of skilled workmen above alluded to, the North of England *Iron and Coal Trades Review* says: "It is a national disadvantage that so many of our skilled men should be leaving us, especially as the old and very young do not leave in anything like the same proportion. The strength and skill of our best mechanics and artisans we ought by all means to keep, and it is well worth consideration whether something cannot be done to arrest the current of foreign emigration, and to turn it into home fields, where it is greatly needed."—*Bulletin of American Iron and Steel Association.*

MINING SUMMARY.

Nevada.

THE MINES OF AUSTIN AND VICINITY.

A correspondent of the *Scientific Press* writing from Austin says: "I visited the mill of the Manhattan company of New York, and was conducted through the works by the general manager and superintendent, Mr. A. A. Curtis, a most energetic and capable gentleman. The mill is at present standing still, while being re-modeled for the introduction of the Stetefeldt furnace, which is being built under the supervision of Mr. Edward V. Standish, whom you may know as a brother of the inventor of the Standish steam plow. The furnace will, it is thought, be in operation about the tenth of June, when, no doubt your readers will have full accounts of its working. This company has bought the exclusive right for the district. Some miners are apprehensive that they will take advantage of this to keep up the price of working ores; but I am given to understand that the price will be reduced as much as possible. The furnace will be a blessing to the place, and will do much to develop the mines, if properly managed. Many mines on Lander Hill are now idle, and the times have been very dull; but with the successful operation of the Stetefeldt furnace, and with other improved processes which are bound to come, I look forward to a general brightning at no distant time and to renewed prosperity in the district. I send you a few notes relating to the present condition of some of the principal mines.

"The Manhattan company, under its energetic management, have put in a new pump and engine lately, and are making other improvements. They will soon have about a hundred men at work, and evidently mean business.

"The Pacific S. M. company, of London, which has lately invested here, is at work on its mine west of the Manhattan, and is down 600 feet. They started in last December, and are pushing work under the able superintendence of Mr. James Brown.

"Mr. D. F. McKim and others have lately struck a fine body of ore, yielding from $100 to $300 per ton, in the Plymouth shaft, to the west of the Pacific, having leased the mine from a New York company. They are stowing the ore away in the drifts (being fearful of losing it, should they bring it to the surface) until the furnace and mill shall get to work.

"The main shaft of the Toyabe S. M. company, of Philadelphia, is down 330 feet. I went through this mine in company with Mr. C. W. Calvert, the superintendent and part owner. Passing about 25 feet west, where the Lizzie Calvert ledge was struck, I found the vein 27 inches wide; but they have run a drift some 135 feet along the lode, when it widens out to four feet. Three different assays of the ore were returned as $127, $788, and $3,003; only two men are employed, however, at present, night and day.

"On the Waverley ledge, owned by Geo. W. Henry & Co., they are 100 feet down and in ore assaying from $400 to $600 per ton. They are hoisting by means of a windlass. The Union Pacific Tunnel Co., of New York, have their tunnel about one mile from town, on the grade going up the cañon. This was surveyed to run in under Lander Hill, having a direction of N. 71° E., and to cut the ledges nearly at right angles. At the mouth of the tunnel is an open cut, 150 feet long and 44 feet wide, and having a face 22 feet high at the tunnel. This latter is 9 feet wide and 7 feet high, and is to have a double track. In the bottom they will have a drain two feet square for the water. They are now in some 80 feet, and employ daily nine men in three shifts. The greatest depth below the surface will be 1,500 feet. At a distance of 350 feet from the mouth they expect to cut the Old Pony ledge, and after this many others, among them the Manhattan and Lane & Fuller. They talk of erecting at the entrance a wall 4 feet thick and 22 feet high, and a frame building 44x50 feet, for the ore house, blacksmith shop, and office. They have bought 58 acres of land near the tunnel. The water they intend to carry around the side of the hill and use for irrigation purposes. Their work is attracting much notice, and, if successfully prosecuted, will bring about great results. The officers are: B. L. Franke, President; J. W. Naughin, Secretary, and T. J. Harlem, General Agent at the mine."

THE COMSTOCK.

The Gold Hill *News*, May 14, reports the daily yield of the Hale & Norcross mine to be 160 tons; the principal supply being now from the 7th or lowest level, recently opened. At this point the body of ore is, according to the *News*, the best ever yet found in the mine, being not only of high grade but of great extent. The lower tunnel of the Overton mine will be completed in about a month. The foundation work of the new mill is progressing favorably. At the Crown Point the incline from the 1,000-foot station of the shaft is 87 feet deep to-day, but the rock met with is hard porphyry and quartz, therefore rather slower progress is made sinking. There is no water to interfere. The daily yield is about 65 tons, all from the upper levels. A new dump is completed by the side of the lower Gold Hill branch of the railroad, and next week they expect to commence shipping ore to the mills on Carson river. The Gould & Curry is yielding about 70 tons daily of good grade ore from the old mine. The various prospecting drifts at the 7th or lowest level look promising, but develop no good ore deposits as yet. The bullion receipts from the mine for April footed up to $48,721 80. C. C. Batterman has entered upon his duties as superintendent of this mine in place of P. Deidesheimer, resigned. The Sierra Nevada is about the most regular in its yield of any mine on the Comstock. The surface deposits seem inexhaustible, especially the eastern one, which supplies the mill at present. The daily yield of the Overman is about 125 tons. The body of ore found a few days since, in drifting north at the 500-foot level, was not at first thought to be of much importance, but present developments indicate it to be both good and extensive. The daily yield of the Hope is 30 tons, all of which is worked at the two mills of the company. The lower level continues looking better and better as developed, and the general yield of the ore from the mine is over $20 per ton on the average. At the Kentuck an improvement is manifest in the character and yield of the ore during the past week, in the ore-producing sections of both upper and lower levels. The daily yield is about 50 tons, which is worked at the Pioneer mill. The California is yielding 30 tons per day of fair grade ore from the 200-foot level. The face of the drift west is still in porphyry and quartz, but it will shortly be through. Meanwhile the ore is being drifted out both north and south. The Yellow Jacket mine is giving forth its usual regular yield of 350 tons per day—200 of good grade from the lower levels, and 150 of low grade from the upper levels. The ore body at the 900-foot level, after passing to the north of that "horse," was not quite so good at first as that portion south of it, but within the past few days it has improved vastly, and develops into a large, valuable, and permanent body—as good as any yet found in the mine. It is one of the most promising deposits ever developed in the Comstock lode. At the next level below—the 1,020-ft.—the one ore body developed there is giving forth a very satisfactory yield, and bids fair to hold out for a long time. The drift north, at the 1,10 -foot level from the Crown Point, is progressing well under the new contract, and will shortly be where it should intersect the excellent bodies of ore developed above. The timbering, ore extraction, and general work of the mine is judiciously and advantageously performed, and by drift and winze connections good currents of air are induced, giving good ventilation wherever possible throughout the mine. The finding of these excellent ore deposits at the lowest levels, as in the case of the Hale & Norcross, is very encouraging both to the present and future prospects of our mines. These are the only two points on the Comstock at the present time where ore deposits are developed at such depths; but other companies, seeing the hopeful example set, may be encouraged to "go and do likewise." The daily yield of the Chollar-Potosi is about 200 tons of good grade ore. All the ore-producing sections are looking and yielding well, especially the new resources developed south of the old Blue Wing. At that point a very excellent and extensive body of ore has been developed under the present effective management, by drifting south 180 feet beyond where the Blue Wing was supposed to have given out. The ore pays exceedingly well, containing considerable gold. This new resource is designated and known as the Belvidere section, and adds greatly to the bullion product of the mine. In consequence of the satisfactory yield of the mine at present, dividends to stockholders are made regularly every month and the treasury of the company is in a healthy state. The new mill of the Sacramento & Meredith company, erected in the vicinity of the mine, is completed, and is to be started up on ore from the mine. At the Virginia Consolidated the west drift from the 500-foot station of the new shaft is now in 352 feet, and owing to the favorable nature of the rock encountered, good progress is made. There has been nothing new developed on the Ophir since our last report. The Ogden mill is being run on ore from the south shaft of the old mine. The ledge is not yet cut by the lower drifts. The Belcher has developed nothing new since our last report. The yield is the same, and the prospects for ore at the 730-foot level do not improve.

HUMBOLDT COUNTY.

The *Silver State*, of April 26, has the following: "The Oreana Smelting Works will start up in three or four days, on ores produced in that neighborhood. Two large furnaces and the mill will start at the same time, with a capacity for reducing about twenty tons per day. There is now nearly four hundred tons of ore on the ground, mostly of a low grade. The owners of the Butte mine in Battle Mountain district have determined to locate and lay off a town site in the immediate vicinity of their works, to be called Butte City."

PLACER MINING IN ELKO DISTRICT.

According to the Elko *Independent*, May 4, the Lytle ditch, to bring water to the placer fields near Mountain City, has been completed its full length, and mining is going on successfully. The placer mines in Bruno district are panning out well, and extensive works are projected for ditching and sluicing on a large scale. In Bull Run basin work has commenced in earnest, and the miners have the very best prospects for making a good season's work. In Tuscarora district, in Independence valley, a number of white men and quite a crowd of Chinamen are at work taking out dust, which is found to pay good wages.

Missouri.

MILL-STONE QUARRY IN CEDAR COUNTY.

The Springfield *Southwest* makes mention of the opening of a quarry of burr for mill-stones, in the northwest part of that county, the product of which is thought to be superior to French burr. The *Southwest* says: A discovery of great importance to millers, has recently been made in the northwest part of Cedar county. It is that of a rock far more valuable for mill-stones than the celebrated French burr. Hearing of the value of this rock, we took pains to witness its work at the extensive mills of Mr. Mitchell, of this city, where we found old millers highly elated over its complete working. Its qualities over the French burr are—first, it is more porous; second, tougher; third, does not glaze as badly, grinds cooler and holds its dress better. The size run in this mill is about three feet in diameter, and grinds easily in twelve hours 150 to 225 bushels, owing to the dryness of the weather and grain. The Springfield Iron Works are putting up these excellent burrs, 30 inches in diam-

eter, ready for the belts, at the very reasonable price of $320. There is not a doubt but their value will soon make for them a lively market.

Colorado.

THE DROWNED MINES.

Advices from Central City, of May 25, state that the Briggs mine has been compelled to shut down, in consequence of being drowned out by water from the consolidated Gregory mine. The *Herald*, May 10, has the following account in this connection: "The water in the consolidated Gregory mine has been raising at the rate of from five to six feet per day, until yesterday, when it began to run over into the Briggs mine. In the Gregory there is now a body of water three hundred feet long and two hundred feet deep. In the Foot & Simmons there is about the same, and fully that much in the Black Hawk mine. It must be fully four hundred and fifty feet in the latter. The Briggs and Smith & Parmelee mines will be filled in a very few days. In the Gregory there is ground enough to employ the present force for nine months to come. The ore now coming from the mine supplies twenty-five stamps, and is very rich. The run cleaned up thirteen ounces to the cord."

THE BAKER MINE.

A writer in the Central City *Register* speaks as follows of the Baker mill, mine and company, at Bakerville: "The Baker mill, about eight miles from Georgetown, is probably the finest in the country. It has been built without regard to cost, with a view to the best and most economic method of treatment by Bruckner's roasting process. The mill now contains three cylinders, with the necessary crushing and amalgamating machinery, but it was built with the view of increasing the works, should it ever be necessary to double their present working capacity. Some costly experiments have been made in this mill—among other things, a smelting and a cupel furnace have been erected. But under the management of Mr. Bechtel, the present Superintendent, all useless expenditure has been stopped, and the work now being done appears not to be so much for display of theory as for business and profit. The cylinders are a little larger than the others of the Bruckner patent in this country, and will hold about four thousand pounds per charge. The barrels are six in number, and will each hold three thousand pounds. Quite a pile of ore was in the mill, and we are informed that the mine is now producing about seven tons per day. We append a statement, kindly given us by Mr. Wolters, the metallurgist of the company, showing what has actually been done: There have been worked 267 tons of Baker ore; ten tons of Terrible, and seven tons of slag and debris, found in tearing down the smelting furnace—making a total of 284 tons, with an assay value of $21,825 76, coin, or an average value of $76 85 per ton. The yield from the above, at 80 per cent. of the assay, would be $17,849 59, coin. Since Mr. Wolters has been in charge of the mill the bullion has averaged 757 fine. The whole number of working days to date has been forty-nine. There is now on hand at the mill about thirty tons second-class ore, worth, probably, $60 per ton, coin value. On the dump, at the mine, there are about fifteen tons of first-class ore, averaging $150, coin, per ton, and sixty tons of second-class, assaying like that in the mill. The present capacity of the mill is from thirteen to fourteen tons daily, and while the present workings in the mine will not supply that amount, the force will soon be increased, and an effort made to keep the mill busy."

STAMP MILL IMPROVEMENTS.

The Central City *Herald* says that the Lexington 24-stamp mill, which has been leased from the Central Company, by Sallivan & Co., is nearly ready to start up. It has been thoroughly renovated under the superintendence of W. O. Logue. The stamps, says the *Herald*, have been supplied with Baltoff's stuffing guide box, a new thing here, and we believe a good invention. It consists of an iron casing for the stem, the upper part of which is a heavy screw. The rope packing is put in loosely, and then screwed down to the requisite firmness. The stem comes in contact with nothing but the packing and a jet of clear water coming in immediately below, free from sand and grit. When once properly adjusted the box need not be disturbed for six months. Each guide box is firmly screwed to a solid piece of wood. The new tables are also something extra in that line, being made of heavy strips, like billiard tables, which give solidity to the whole structure. They will each be covered with copper plates eight feet long, and two feet of composition plates at the lower end. The tailings will be run in Bartola pans. Two large water tanks have been put up."

The same journal has also the following items of news: "Mr. B. C. Waterman has purchased a 20-stamp mill from the Eagle Works, Chicago, which is now on the way, and will arrive in a few days. It has a double issue California battery, made on the latest and most approved pattern. It will be put up in the Kansas-Colorado building, and will be ready to run in about six weeks. Mr. Waterman says he can mine and mill two ounce ore with a profit, and he is going to do it. Mr. E. L. Salisbury has a new 20-stamp mill, with all the modern improvements, on the way from Pittsburgh. It is a duplicate of Lake's new mill, and will arrive in a few days, and will be run on custom quartz. The Keith furnace is to start up in a short time on ore from the Mammoth lode."

THE COALEY AND GILPIN COUNTY LODES.

These lodes, lately purchased by Mr. A. D. Breed, of Cincinnati, Ohio, and now being worked for him by Mr. B. O. Cutter, late of White Pine, are, according to the *Register*, May 4, yielding handsomely. Mr. Cutter is at work drifting and sinking. There are three shafts on these mines, one at the mouth of each drift, 75 feet on the Coaley, and 64 feet deep on the Gilpin. The third, which will be the main shaft, is now 64 feet, and starts at the junction of the two lodes. A contract to sink this 100 feet deeper has just been let. From the bottom of the Coaley shaft a 75-foot level is being run, and is now 134 feet long. There are now 24 miners employed. The ore is treated at the California Reduction Works, and averages about $160 per ton, as it comes from the mine, after throwing out the wall rock. The present yield is about four tons per day, but when the mines are fully operated, Mr. Cutter expects to average from six to eight tons the year round. In the bottom of the shafts and drills, as well as in the west headings, the vein of solid mineral is nearly twelve inches wide. At a moderate estimate, the vein of mineral must average six inches throughout the present workings.

Idaho.

NEW RICH DIGGINGS.

The *Utah Reporter* says: Late discoveries on Snake river in Idaho have developed the fact that along that stream for a distance of over 300 miles placer diggings abound, and that gold is plentiful. At a point 120 miles northwest of this city over a hundred men are at work with rockers, and take out on average from ten to twenty-five dollars in dust daily. Ordinary effort exceeds five dollars to the man, and it is believed that now, as the spring has opened, the placers along the Snake will turn out remarkably productive. We have these facts from Mr. Morrison, a gentleman direct from the diggings, and well known here as a most reliable gentleman. He is here for supplies, and goes back immediately to the river. The place can be reached from here in from four to six days over good roads and fine grazing country.

THE OWYHEE MINES.

The *Avalanch*, May 7, says: The Golden Chariot is now in fine shape for working. The lower stopes are yielding ore exceedingly rich, the best of which is being put up in sacks to prevent a waste of mineral. There is, at present, over 200 tons in the shute. The Ida Elmore shute is also full of rich ore waiting to be transported to the mill. Splendid rock is being taken from the lower level. The Baxter, under the manipulation of Wilford, France & Co., is yielding very rich silver ore. A two-pound specimen presented to us by Mr. France is beautifully studded with ruby silver interspersed with the crystallized mineral. Mr. Peck struck a rich chimney in the Potosi yesterday. We examined some of the quartz, which is of a light color and completely matted with gold. It is good for the blues. High water prevents placer mining to advantage in the creek, but is being prosecuted with vigor in Blue, Jacobs, Slaughter House and other gulches.

California.

THE SILVER FURORE IN STANISLAUS.

Concerning the mining excitement in Stanislaus county, the *News* of the 5th ult. has the following: "The mining excitement in this county still continues. Every now and then some enterprising prospector arrives from the Coast range, with his pockets full of rocks, called silver ore, or indications. Our people have silver mines on the brain to a fearful extent. After our visit to the mines we thought the fever would die out, but in this we were mistaken. The most of our citizens are millionaires. Meetings for the organization of companies are of daily occurrence, consequently prospecting and camping outfits are in demand. Every once in a while we detect men slipping off silently and alone to the mountains, with the view of locating claims. What all this excitement will amount to we cannot as yet tell. If there is not silver in the mountains near here, then there are many good judges of mines badly sold. For our own part, our experience in the mines has been of a practical character; we always did miss it on indications. All we can say is, that the ledges look well, and friends assure us that they are rich in silver. We will keep our readers posted as to the facts of the case, as the mines are developed. In the meantime, work is going on bravely, and the mountains are filled with excited miners, who contest the trails in the dense chapparel with the grizzly bear."

THE ALPINE COUNTY MINES.

A survey of the Mountain claim, just made by Surveyor-General Marlette, of Nevada, shows the distance to be 1,725 feet from the mouth of the tunnel to the perpendicular of the ledge, and the depth 1,010 feet. The distance to the perpendicular of the ledge in the upper tunnel is 1,983 feet, 133 feet from the face of the tunnel, which is now in 1,850 feet. So, instead of having already passed the ledge, as has been asserted, the company have 133 feet further to run before they can really expect to reach it.

Wales.

LEAD MINING—HOW THE ORE IS REDUCED AND CONCENTRATED—INTERESTING HINTS TO CALIFORNIA MINERS.

Writing from the Devil's Bridge, a town in the heart of the lead mining district in Wales, a correspondent of the San Francisco *Bulletin* gives a description of the manner is which they reduce and concentrate the ore there, the importance of which cannot be overestimated, although it is sadly neglected by the miners in this country. Says the writer:

"There are several lead mines of great importance in this immediate neighborhood—the Lisbourne, Frouloch, East Logylas, Glog Fach, Level Fawr, and others, all of which agree in their general mode of treatment, with of course a few slight differences in the details of their machinery, according to the character of the ores produced from each mine, and in giving the description of the mode of treatment in one I will thus be describing the mode of treatment in all.

"CHARACTER OF THE ORE—ECONOMY IN WORKING.

"The deposits of ore found here are in combination with the same gangue as those on the Pacific coast, the stratification being identical, but the quality of the mineral, as compared with the deposits in California, is far inferior to your poorest, containing a much smaller quantity of silver, which very rarely reaches as high as ten ounces per ton. Generally the ore is also diffused through a large quantity of barren rock, which greatly decreases its value, inasmuch as it increases the difficulty and cost of separating it from the same, and it is only by using the most perfect and complete machinery possible for dressing and concentrating it that they are able to make it pay for working at all. To economize in manual labor by the introduction of cheaper mechanical appliances, is the object which continually claims their special attention; and apparently they have succeeded in attaining a point of perfection in that respect in the reduction and concentration department, nevertheless I am informed that the machinery employed in dressing operations in the lead mines of Germany is superior in efficiency, elegance and durability to that which is used here, and accounted for by the Germans having manufactories giving employment to about four hundred hands which are devoted exclusively to the construction of dressing machinery, while here the most part of the machinery is made at the mine by the ordinary staff.

"DRESSING THE ORE.

"The principle applied in the dressing of lead ore is similar to that of gold; the ore being separated from its accompanying impurities by its readier gravitation, and the operation being more or less difficult, according to the greater or less specific gravity of those impurities. To dress it successfully it is requisite that the ore should be equally sized or assorted, then the superior specific gravity of the lead, assisted by the action of water, naturally separates itself from the refuse. It is to this assorting or regular sizing of the material treated that their whole machinery is devoted. If the ore, as it comes from the mine, exists in bunches, it is placed upon a grating consisting of two rows of bars, one above the other, the bars of the upper row being about one inch apart, and the bars of the lower one about half an inch. Upon this grating a stream of water falls, cleaning the ore and washing the finer particles through it into a box, with an armed wheel kept in motion so as to separate the refuse matter from the finer ore, which settles at the bottom. Connected with this box are a number of other boxes, successively arranged so as to catch the finer particles which may attempt to escape with the refuse.

"CRUSHING THE ORE.

"Coarser ore, which is almost entirely fine galena, having probably only a piece of gangue attached to it here and there, is subject to a coarse crushing only, and requires very little further treatment in the way of washing, to liberate it entirely from the little refuse connected with it. The picked ore is divided into good, medium, and poor. The good ore is crushed to about the fineness of common garden peas. The machine employed in crushing consists of two large rollers placed horizontally, side by side, and working towards each other. The ore intended for crushing is thrown by the pickers into a large bin which supplies a hopper placed immediately above the rollers, which it feeds, thus saving the more expensive and irregular manual labor which would be otherwise requisite for that service. A stream of water is kept constantly running upon these rollers, so as to keep them from being clogged by the accumulation of the pulverized ore. After passing between these rollers the ore then falls into a circular seive or tunnel, as it is called here, which is placed on an inclined plane. Through this seive the ore that is crushed to the requisite fineness passes into sluices placed underneath, and through which a body of water passes, carrying with it the lighter portion of the impurities which may be mixed with it; but that which may still continue to be too coarse is discharged at the foot of the seive into the buckets of a revolving raff wheel, which raises it back into the hopper and it is then recrushed. Having been reduced to the requisite size, it then passes into jiggers, and the waste matter is then skimmed off the surface by the hand. (A new jigger has been lately introduced, worked altogether by machinery, the waste matter being brushed off the surface by it also, dispensing with manual labor altogether.) A large quantity of the ore, however, becomes crushed much finer, and as the successful concentration is dependent upon a regular sizing, the ore is compelled to pass from the sluices through a number of other circulating seives of different sizes, and a regular assortment is obtained and respectively treated in hand buddles, or else returned to the crusher to be pulverized into slime; after which, it is treated in the buddles. The heads of the buddles then undergo a final treatment in the dolly, from whence the ore is produced ready for market.

"PULVERIZING—CONCENTRATION OF SULPHURETS.

"Should the ore obtained from the mine be disseminated in fine particles throughout the gangue, it is at once pulverized into slime, and then passes through the jiggers, buddles and dollys. These buddles and dollys are similar in construction to those in operation in Grass Valley and elsewhere for the concentration of sulphurets. In the arrangement of their dressing floors, upon which a considerable portion of their success in treating these ores depends, the machinery is so constructed that the ore, after passing through one course of treatment, naturally falls into the machinery ready to receive it for its further concentration. Its efficiency is perceptible in the limited amount of manual labor employed as auxiliaries, as it only requires a few women and children to superintend the whole operation.

"THE MISTAKE OF CALIFORNIA MINERS—NEED OF THOROUGH REDUCTION.

"To concentrate their sulphurets by one process is evidently a great mistake, and, in fact, an impossibility, being in direct opposition to the laws of gravitation, by which its concentration ought to be controlled to result successfully. The great difficulty appears to exist in properly assorting the ore in regular sizes, after which concentration becomes easy.

"There is no doubt, from what I have already said, that it is impossible to acquire a thorough knowledge of reducing and concentrating the ore without obtaining a thorough education in that branch of useful knowledge. Your mining population are too apt to think that by the mere observation of the working of the machinery used by others they can copy and imitate with equal success; such, however, is a fallacy, proven to be such by every experiment hitherto made, and there is no doubt that the tailings of the mining districts of the Pacific coast contain millions of dollars' worth of sulphurets irrecoverably lost through this assumption. The men in charge of the dressing rooms here are men who have been brought up in them from infancy, grown with and partaken in all the changes and improvements which time and experience have brought about, and such men only are considered to be capable of efficiently superintending them.

"LOW GRADE ORE WITH IMMENSE PROFITS.

"The lodes here are not continuous in the yield of ore like the quartz ledges of California, as in many cases the lode is entirely barren, the ore generally occurring in branches, or chambers, as they are called here. The ore, as taken from the mine, averages about ten per cent. lead only, which is concentrated until it reaches seventy or eighty per cent., at which stage it is only worth from seventy to eighty dollars per ton of 2,240 pounds, its value depending upon the amount of silver it contains, which, as I have before stated, never reaches a high grade.

"That lead mining is a good and profitable business, and the safest of all mining investments, is substantiated in the fact that there are more dividend-paying lead mines than any other kind whatever. An example of the wonderful increase in the lead mines of this country, showing their great importance, is to be seen in the Nan mine, in Montgomeryshire, which was sold a little over a year ago for $150,000, and the market price of the same now is the enormous sum of $5,160,000. The Lisbourne mines, also, upon which only $37,500 capital has been paid up, have returned to the shareholders, during the last few years, in profits, the handsome sum of $1,250,000.

"AN INCENTIVE TO MINERS—CHEAPNESS OF REDUCTION.

"The miners here are frequently paid for their labor by receiving a percentage upon the ore they produce, contracting for such rate for a given length of time. Men thus employed have frequently been able to make large amounts of money, and have, in some cases, amassed fortunes by the fortunate striking of rich chambers or bunches of ore.

"That which surprises me particularly, in connection with these mines, is, comparatively speaking, the small amount of capital which is invested in the machinery used in the dressing floors, and also the extreme cheapness of the reduction and concentration of the ore. The average cost of erecting the necessary machinery for dressing and concentrating, including an engine, is estimated at $6,000. The entire cost of dressing and concentrating the ores ready for market is estimated at about $3 25 per day, treating during that time about fifty-five tons of ore, the cost of treatment per ton of raw material averaging about 4½ cents, or about fifty cents per ton of clean ore produced. With the same machinery, and the same system of working, the same amount of work could as easily be done in California for about treble the cost, which would make its lead deposits the best paying stock in the country."

BUSINESS AND PERSONAL.

[*Short notices in this column fifty cents per line each insertion.*]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents. C. D. FREDRICKS, 587 Broadway, N. Y.
April 19 tf.

MARKET REVIEW.

The Coal Trade.

NEW YORK, June 3, 1870.

WHOLESALE.—There seems to be more doing in coal circles. Retailers' stocks are running low, and some anxiety is being felt about a winter's stock. This month has been, for years back, the most propitious for buying coal; consequently all parties, retailers as well as consumers, are digesting the coal question pretty thoroughly. Many have thought well to hold off buying, fearing a break in prices in case the Schuylkill men should resume operations. The men won't resume at any rate, until July 1st.; up to which time every sensible dealer ought to have looked for his supply.

Out-of-town buyers must bear in mind that the great difficulty has been, heretofore, to supply all at one and the same time. Vessels become scarce, and the difference in the advance in freights of from thirty to fifty cents per ton, is virtually an advance in the price of coal, for it enhances its value just the amount of extra freight. Freights will, in all probability, advance as June passes away, until, at the first of July, there may be a great difference; so that, in reality, he who purchases coal now, early in June, when freights are low, gets his stock as cheap as he who purchases July 1st, perhaps at lower figures, but at an augmented rate of freight.

It would be well, we think, to take the market moderately, not all at once, take up vessels as they offer; secure a partial supply, at least now, and hold off for further advicee. Our table shows an increase in shipments of anthracite coal for the past week of some 250,000 tons. This is in consequence of the strike that pervaded the entire coal regions last year this time. Our table also shows a surplus in grand total of some 700,000 tons. Some 400,000 tons of the latter is piled up at Honesdale, and the balance is in course of consumption, or placed at the various tide-water shipping-points.

This surplus is enough to keep any panic in the coal trade at bay, but at the same time, should all retail dealers and consumers take it in their heads to want coal immediately, and all come in the market at once, it would disappear like the mist of the morning—prices would advance, and somebody get hurt. Our quotations for June show an inclination among those who had the governing power in this market to keep down all excitement, and, we fear, have been made at a lower figure than last winter, in some instances, expecting few sales. The large companies know well that the demand must come sooner or later, and if it can be pressed all into a few weeks, amidst the clamor and excitement that must ensue, one or two dollars advance can be readily obtained. We don't want any of our friends to be caught napping by this dodge. Commence to lay in a portion of your stock now; but do it quietly, and we will checkmate those chaps when they think we are awful hungry for coal. To make money out of coal now-a-days, one needs to keep coal and his wits about him.

FREIGHTS.—Vessels are in good supply, and freights rule very low.

PRICES.—Lehigh coals are firm; the larger sizes are in short supply. Other coals are selling a shade under our quotations. New prices for June this week.

ITEMS.

The miners in the Schuylkill region refuse to resume on the operators' basis of $2 50 per ton at Port Carbon.

The Lehigh Coal and Navigation Company's men are yet on a strike. See communication of Mr. Clark elsewhere in this week's paper.

The Delaware & Hudson Coal Company have removed from 7 Nassau street to 71 Broadway, where they have increased facilities for carrying on an extensive business. The coals of this company are deservedly popular, as great care is taken in their preparation, and the company is now working its finest ores. James C. Hartt, Esq., as usual, is on hand, giving a *hearty* welcome to all, and selling stocks of coal.

The market for foreign coals is improving.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending May 28, 1870, compared with week ending May 29, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R	817	1,174,462	35,568	970,397
Schuylkill Canal		182,108	3,097	30,755
Lehigh Valley R. R.	922	850,038	65,194	1,311,836
Lehigh & Sus. R. R.	152	390,723	20,564	385,262
Lehigh Canal	1,034	173,149	18,773	86,118
Scranton North	921	205,857	14,574	246,017
" South	3,901	587,630	38,845	714,149
Penn. Coal Co., rail	24,313	342,902	24,542	432,587
" " " canal	834	4,269	1,319	4,533
Del. & Hud. Canal Co.	35,870	398,051	29,431	342,539
" " R. R.	464	98,941	7,323	208,322
" " south		4,585	14,519	156,116
Shamokin	1,270	137,980	7,720	125,935
Trevorton		7,084	3,202	31,457
Lykens Valley Coal Co.	1,459	20,006	4,769	22,383
Wyoming South	3,758	37,391	4,024	55,243
" North			5,962	121,326
P. N. Y. C. & R. R. Co.			4,442	107,077
Williamstown, Cal'y	42	56,694		
Total	75,427	4,681,101	333,433	5,410,102
1869			75,427	4,681,101
Increase week and year			258,006	729,001

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending May 28, 1870, compared with week ending May 29, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	22,330	347,937	19,956	313,944
C. & O. Canal	18,675	147,604	17,615	142,735
H. & B. T. R. R.				
Harrisburg & D.			16,780	316,554
L. V. R. R.		552	1,466	6,622
P. & N.Y. C. & R. Co.			5,638	89,858

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending May 26, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	35,568 14
Previously this year	934,828 15
Total	970,397 09
Same time last year	1,174,802 00
Decrease	204,464 11
Amount sent same week 1869	817 09

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, May 26, 1870:

From St. Clair	
" Port Carbon	2,105 03
" Pottsville	170 15
" Schuylkill Haven	15,984 11
" Auburn	1,552 05
" Norristown	937 13
" Port Clinton	9,452 14
" Allentown and Alburtis	5,395 13
" Harrisburgh and Dauphin	16,780 16
Total paying freight	52,349 10
Coal for Company's use	5,951 02
Total for week	58,300 12
To same time last year	1,225,817 15
Total	1,284,118 07
To same time last year	1,453,549 16

Report of coal transported over the Schuylkill Canal for the week ending Thursday, May 26, 1870.

	Tons.	Cwt.
From Port Carbon	3	7 —
" Pottsville	351	— —
" Schuylkill Haven	2,359	10
" Port Clinton	—	—
Total for week	3,097	10
Previously this year	27,657	14
Total	30,755	04
To same time last year	182,198	05

Report of Coal Transported over Lehigh Valley Railroad

For the week ending May 28, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons.	Cwt.	PREV'LY. Tons.	Cwt.	TOTAL. Tons.	Cwt.
Total Wyoming	12,983	13	284,304	03	297,287	06
" Hazleton	50,814	13	784,859	16	835,774	09
" Upper Lehigh	60	03	5,394	09	5,454	12
" Beaver Meadow	18,009	08	263,185	04	281,194	12
" Mahanoy	3,431	10	106,461	01	109,892	11
" Mauch Chunk			447	17	447	17
Total Anthracite	85,298	17	1,444,752	10	1,530,051	07
Bituminous Coal recv'd from Cata. R. R.						
N. C. R. R.						
E. P. R. R.	1,466	00	5,156	00	6,622	00
P. & N.Y. C. & R.R. Co						
Fall Creek						
Schroeder						
Towanda						
Total by rail and canal	86,764	17	1,449,908	10	1,536,673	07
Same time last year	395	11	1,863,153	03	5,063,108	14
Increase	85,809	06	381,755	07	467,564	13
Decrease						
Forwarded East from M'h Chunk by rail	65,194	01	1,246,642	01	1,311,836	02
Same time last year	9	2 11	944,085	11	950,018	02
Increase	64,271	10	297,546	10	361,818	00
Decrease						

RECAPITULATION.

Forwarded East from M'h Chunk by rail	65,194 01	1,246,642 00	1,311,836 02
To N. C. R. R., at Mount Carmel		115 00	115 00
Forwarded North from L. & B. Junction	5,961 04	114,939 13	120,900 17
To L. & S. R. R. at Packerton for rail	69 07	3,662 14	3,732 01
Delivered at M'h Chunk	6 06	580 15	587 01
Delivered on line of road above Mauch Chunk	164 04	6 477 06	6,641 10
Delivered above M. Chunk for use of L. V. R.R.	1,216 04	24,386 16	25,603 00
To L. & S. R.R., at P'n Hav., for railroad			
Do for canal	8,858 04	30,391 02	39,249 06
At M.Chunk for canal	3,329 07	17,557 03	21,386 10
Total Anthracite	85,298 17	1,444,752 10	1,530,051 07
Bituminous Coal	1,466 00	5,156 00	6,622 00
Total all kinds	86,764 17	1,449,908 10	1,536,673 07

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals.

Week ending May 28, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons ct	WEEK, 1869. tons ct	YEAR, 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	28182 15	981 06	42265 12	253872 03
Upper Lehigh Region	981 15		44494 00	56577 19
Mahanoy Region				878 01
Hazleton Region	9239 05		42948 11	52306 14
Beaver Meadow Region	4577 00	181 00	21399 14	24040 00
Mauch Chunk Region			30089 18	11+561 18
Totals	45980 15	1162 06	561197 15	5058+9 15
Increase				
Decrease	44818 09		55308 00	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	20563 18	152 17	385262 19	300724 01
Forwarded East of Mch Chunk by Canal	18773 13	1004 04	84118 10	173130 00
Delivered at and above Mauch Chunk	823 19	5 05	15780 15	13831 08
Delivered to L. & B. R. R. at Plymouth Bridge	5319 05		76035 11	13775 03
L. V. R. R. at Sugar N.				5100 03
Totals	45980 15	1162 06	561197 15	505889 15
Of the above there was from Mines controlled by Co., W.B.C. & L.Co	11775 18	5 05	171283 06	122841 00
L. C. & N. Co			46743 15	11+561 18
Totals	11775 18	5 05	218004 01	24140 18
Increase				
Decrease	11770 13		23398 17	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, May 30, 1870.

	WEEK.	SEASON.
North	46,567 10	910,686 14
South	14,519 06	156,116 01
Total	61,086 16	1,066,802 15
Corresponding time in 1869.		
North	1,996 10	701,855 14
South		41,933 07
Total	1,996 10	743,789 01
Increase North	44,571 00	Increase 208,831 00
Increase South	14,519 06	Increase 114,182 14
Total Increase	59,090 06	Increase 323,013 14

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending May 26, 1870:

	Tons.
For week	16,780 16
Previously this year	299,774 03
Total,	316,554 19

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending May 31, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	5,962 02	115,364 11	121,326 16
Bituminous	5,638 00	84,220 00	89,858 00
Total, Ant. and Bit.	11,600 02	199,584 11	211,184 16

Shipments of Cumberland Coal

for the week ending Saturday, May 28, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M	29 05	.....	29 05
Borden	1,838 09	2,654 03	4,492 12
Consolidation	4,324 01	4,267 11	8,591 12
Spring Hill	475 06	.....	475 06
Midlothian	813 04	103 12	916 16
H. and Baltimore	10 08	1,050 01	1,060 09
do Va M	1,080 07	.....	1,080 07
National	.....	.....	.....
G. C. C. and I.	2,169 04	724 17	2,894 01
Maryland	4 193 09	7,460 13	11 654 02
American	1,776 18	4,285 07	6,062 05
Atlantic	479 03	.....	479 03
Piedmont	1,491 10	.....	1,491 10
Swanton	761 06	.....	761 06
Barton	720 00	.....	720 00
Potomac	1,760 00	.....	1,760 00
Franklin	1,278 05	.....	1,278 05
Big Vein	1,232 16	.....	1,232 16
Total week	24,442 11	20,546 04	44,988 15
Previous	375,606 05	152,175 18	527 782 03
Total year	400,048 16	172,722 02	572,770 18

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, May 21st, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons.	Cwt.	B. & O. R. R. Tons.	Cwt.	TOTAL. Tons.	Cwt.
1870	17,615	13	19,956	07	37,572	00
1869	18,675	06	22,330	05	41,005	11
Increase						
Decrease	1,059	13	2,373	18	3,433	11

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	142,755 13	313,944 12	456,680 05
1869	147,604 12	347,937 12	495,542 04
Increase			
Decrease	4,868 19	33,993 00	38,861 19

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

SCHUYLKILL.	AT NEW YORK, May 28. R. A.	W. A.	AT PHILADELPHIA, May 28. R. A.	W. A.
Lump	$— —	$5 00	4 50	— —
Steamer	— —	5 00	— —	— —
Broken	— —	5 25	— —	4 50 to — —
Egg	5 75 to 6 25	5 25	— —	4 50 to — —
Stove	— —to— —	5 75	— —	4 50 to — —
Chestnut	4 50 to 5 40	4 75	— —	4 00 to — —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	6 00	— —	— —	— —
Broken	5 75	— —	— —	— —
Egg	5 75	— —	— —	— —
Stove	6 00	— —	— —	— —
Chestnut	5 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*	R. A.			
Diamond Vein	— —		— —	— —
New England	"		— —	— —
Locust Dale	W. A.		— —	— —
Honey Brook, Leh	W. A.	4 75 to 5 75	— —	— —
Spring Mountain	" "	4 75 to 5 75	— —	— —
Sugar Creek	" "	4 75 to 5 75	— —	— —
Sugar Loaf	" "	4 75 to 5 75	— —	— —
Old Comp'y's	" "	4 75 to 5 75	— —	— —
Cross Creek	" "	4 75 to 5 75	— —	— —
Enterprise	" "		— —	— —
Girardville	" "		— —	— —
McMichael	" "		— —	— —
Shamokin	" "	5 50	4 50	— —
Lykens Valley	" "		— —	— —
Broad Top	" "	5 50	— —	— —
Hill & Harris	" "		4 50	— —
Henry Clay	" "		4 50	— —
Powelton	" "	5 50	4 50	— —

Prices for Coal at Mauch Chunk.

	F.L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 50	$3 50	$3 50	$3 50	$3 75	$3 00
Wilkesbarre	3 50	3 50	3 50	3 50	3 75	3 60

" For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f.o.b. at Phila.			$5 00
Lemon	"	"	4 75
Cumberland Vein Coal			5 00
Cumberland C. & L. Co.'s on board		N. Y.	7 00
Maryland Coal Co.	"	"	7 00
Consolidated Coal Co.'s	"	"	7 00

(*Dealers in these coals may be found in our advertising columns.)

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	4 50	4 60	4 75	5 00	5 75	4 60
Pittston at Newburgh	4 60	4 60	4 70	4 90	5 10	4 50
Lackawana at Rondout	4 50	4 60	4 70	4 90	5 20	4 70
Wilk'b're at Hoboken	4 75	4 75	4 85	5 00	5 35	4 60
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	5 50	5 25	5 25	5 25	6 50	4 75

For freights to different points, see "Freights."

Prices at Baltimore—June, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 30@5 50
Pittston and Plyamouth, do	5 10@5 25
Shamokin Red or White Ash, do	5 50@6 00
Lykens Valley Red Ash, do	5 40@5 50
Zerba Valley	25 5@— —
By retail, all kinds per ton of 2240 lbs.	7 00@7 50
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 75@5 00
Fairmont and Clarksburg gas, f. o. b. at L. Point	5 35@5 50

Prices at Georget'n, D.C., & Alexandria, Va.

June, 1870.

George's Creek and Cumberland f. o. b. for shipping..$4 55

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Trevorton and Zerba Valley	— —@— —

Prices of Gas Coals.

June, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 73 Pine st., N.Y. Duty, $1 25, gold.

	Coarse.	Slack.
Block House	$1 75	@— 75
Gowrie	1 75	@— 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Picton	$2 25	@1 25
Sydney	2 25	@— 80
Lingan	1 75	@— 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse.	Slack. Currency.
Fairmount Gas Coal Co. of N. Y.	7 50	@— —
Despard Coal Co.	$7 50	@— —
Penn	— —	@— —
Newburg Orrel Gas	— —	@— —
West Fairmount Gas Coal	— —	@8 00

AT PHILADELPHIA.

Powelton	$7 80

Prices of Foreign Coals.

June, 1870.

Duty $1 25 per ton

Corrected weekly by FARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven	$2 00
From Port Carbon, 8 cents per ton more.	
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 12
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 28

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R.	81
R. & D. R. R.	1 09
Cam. & Am. R. R.	
Shipping Expenses	25
Total	$2 15

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	95
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2 49

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 00

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.

Lehigh Canal	$ 40
Morris "	1 10
Freight, Towing	

TO JERSEY CITY.

Lehigh Canal	$ 40
Morris "	2 00
Freight	
	2 40
For re-shipment	2 50
Total	$

Via Delaware and Raritan Canal.

TO NEW YORK.

Lehigh Canal	$ 40
Delaware Division Canal	50
Delaware and Raritan Canal	35
Freight	1,25
Towage	20
Total	$ 2,50

TO NEW BRUNSWICK.

Lehigh Canal	$ 40
Delaware Division Canal	50
Delaware and Raritan Canal	35
Freight	1 05
Total	$ 2,10

For Re-shipment—30 extra for shipping, and 10 cents, drawback.

Freights.—JUNE, 1870.

TO EASTERN PORTS.	From Philad'a.	From E. Port and Port Johnston	From Newburg	From Rondout
	$	$	$	$
Amesbury	2 75	— —		
Bangor	2 75		1 60	
Bath	2 00	2 00	1 10	
Boston	2 00	1 50	1 75	1 75
Bridgeport	1 60	1 00	1 10	1 20
Bristol	2 00	1 40	1 40	
Cambridgeport	2 50	2 00	1 85	
Derby	2 00	— —		
Dighton	1 85		1 45	
East Cambridge	2 50	2 00	1 85	
Fall River	1 75	1 40	1 40	
Hackensack	1 95	1 50		
Hartford	2 75	1 35		
Jersey City	1 75	50		
Middletown		1 25		
Mystic	1 75	1 25	1 30	
New Bedford	1 75	1 40		
Newburyport	2 15	2 00	1 85	
New Haven	1 50	1 00	1 10	1 20
New London	2 00	1 15	1 15	1 30
Newport	1 75	1 40	1 40	
New York	1 25	50	70	
Norwalk	2 70	1 00	1 05	
Norwich and tow	1 70	1 35	1 35	1 40
Pawtucket	1 90	1 50	1 60	
Portland	2 01	1 75		
Portsmouth, N. H.	2 00	2 15	1 80	1 85
Providence	1 75	1 40	1 45	1 45
Rockport	2 10	— —		
Saco	2 30	2 10		
Sag Harbor	2 00	1 40	1 30	
Salem	2 00	1 60	1 75	1 75
Stamford	2 00	1 00	1 00	
Stonington	2 00	1 30	1 25	
Taunton	2 75	2 00		
Warren	— —	1 40	1 45	
Washington	1 10			
TO RIVER PORTS.				
Albany		1 00	— 60	
Catskill		— —	— 50	
Cockseackie		— —	— 50	
Coeyman's		— —	— 75	
Cold Spring		— —	— 35	
Fishkill		— —	— 30	
Haverstraw		50	— 60	
Hudson		— —	— 50	
New York		— —	— 70	
Nyack		50	— 60	
Poughkeepsie		— —	— 35	
Rhinebeck		— —	— 30	
Rondout		— —	— 30	
Sangerties		— —	— 40	
Sing Sing		— —	— 75	
Stuyvesant		— —	— 55	
Tarrytown		80	— 75	
Troy		1 60	— 75	
West Point		— —	— 35	
Yonkers		40	— 60	

Foreign and Provincial Freights.

June, 1870.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-3 tons	£14 00@£16 00
Liverpool	12s.6d@14.ton
TO NEW YORK.	
Provincial	
Sidney	$— —
Lingan	— —
Cow Bay	— —
Port Caledonia	— —
Little Glace Bay	— —
TO BOSTON.	
Sydney	$— —
Lingan	— —
Cow Bay	— —
Port Caledonia	— —
Little Glace Bay	— —

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40

	Per Boat.
Greenwich,	$70 00
Port Chester,	80 00
Mamaroneck,	70 00
Glen Cove,	
New Rochelle,	55 00
East Chester,	60 00
West Chester,	30 00
White Stone,	30 00
College Point,	25 00
West Farms,	25 00
Flushing,	30 00
Harlem and Mott Haven,	20 00
Port Morris,	20 00
Ninety-first street and Astoria,	16 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

TO RIVER PORTS.

Boats of 150—250 Tons.	Per Ton.
To Manhattanville,	8 cents
Spuyten Duyvil,	8 "
Yonkers,	9 "
Hastings,	10 "
Piermont,	12 "
Dobbs' Ferry,	12 "
Nyack,	14 "
Tarrytown,	15 "
Sing Sing,	16 "
Croton Landing,	17 "
Haverstraw,	17 "
Verplanck's,	17 "
Peekskill,	18 "
West Point,	20 "
Cold Spring,	20 "
Newburgh,	18 "
Poughkeepsie,	22 "
Rondout,	23 "

Boats of 100 Tons	Per Boat.
To Manhattanville, and Return,	$11 00
Spuyten Duyvil, "	13 00
Yonkers, "	15 00
Sing Sing, "	20 00
Peekskill, "	25 00

METALS.

NEW YORK, June 3, 1870.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb.; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	34 00@37 00
Pig, American, No. 1	33 00@34 —
Pig, American, No. 2	31 —@32 —
Pig, American, Forge	29 —@30 —
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@97 50
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	110 —@ — —
Bar, Refined " "	77 50@ — —
Bar, Common " "	72 50@ — —
Scroll " "	87 50@115 —
Ovals and half-round " "	95 —@110 —
Band " "	95 —@ — —
Horse Shoe " "	95 —@ — —
Rods, ⅜ to 3-16 inch " "	85 —@120 —
Hoop " "	105 —@145 —
Nail rod, less 5 ₱ ct.	7 @— 7½
Sheet, Russia, as to Nos. (gold)	— 11@—11½
Sheet, Single, IP, and T Common	5¼@— 5½
Sheet, Galv'd, Nos. 14 to 26 12 and 14 c. 25@30 ₱ c. off	
Rails, English (gold), ₱ ton	59 00 @60 00
Rails, American, at Works in Pa.	71 00 @72 30

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 15 @— 18
English Spring (2d and 1st quality)	— 7 @— 10
English Blister (2d and 1st quality)	— 10 @— 17
English Machinery	— 11½@— 14
English German (2d and 1st quality)	— 13 @— 15
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— — @— 18
American, Spring, do.	— 9 @— 11
American Machinery, do.	— — @— 12
American German, do.	— 9 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 31
Copper Bolts	— @— 31
Copper Braziers, 16oz. and over	— @— 31
Copper Nails	36 @— —
Copper, Old Sheathing, &c., clean	16 @— 17
Copper, Chili Pig	— @— —
Copper, American Ingot	18½@— 19½
Yellow Metal, New Sheating	24 @— —
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 24

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb: Pipe and Sheet, 2¾ cents ₱ lb.

Galena, ₱ 100 lbs.	$— @— —
Spanish (gold)	6 20 @6 25
German, do.	6 20 @6 37½
English, do.	6 20 @6 62½
Bar (net)	— — @ 7 70
Pipe and Sheet (net)	— — @ 7 70

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	— @44
Straits	35½@36
English	35 @37½

PLATES.

	Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₱ box	$8 37½@8 75	$9 75 @10 50	
I. C. Coke	7 — @7 75	8 25 @ 9 25	
Coke Terne	6 — @6 25	7 25 @ 7 50	
Charcoal Terne	7 50 @8 —	9 — @ 9 —	

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign ₱ 100 lbs.	$6 00 @6 25½
Plates, Domestic ₱ lb.	10 @— 11

REMARKS.

IRON.—The demand for Scotch Pig has partially subsided, but as the receipts have again fallen off, and the stock is light, the market has assumed a firmer tone; the sales are 300 tons Eglinton at $34 from dock, and $35 from yard, and 300 do. Glengarnock, $35 50@36 00 from yard. American remains without animation, and prices have a softening tendency; we have only to notice a sale of 50 tons No. 1 Allentown at $33 25. There is an active inquiry for both new and old Rails, and prices are steady at our quoted rates; the sales are 100 tons 50-lb. English at $61 50 gold, and 70 do. American, on private terms. From store, Refined Bar continues in only moderate request at previous quotations. We hear that the Philadelphia makers are taking some orders at $75 ₱ ton, delivered there, and this is about the cost of English laid down here in store.

LEAD.—The demand for Pig is still light, but prices remain steady; ordinary Foreign, $6 25 gold, from store. Bar, Pipe and Sheet, are steady at $7 70 ₱ 100 lb.

COPPER.—New Sheathing is steady at 31c., and Yellow Metal 24c. cash. The demand for Ingot is very limited, though prices are without change: 50,000 lb. Baltimore sold at 18¾c.; 25,000 lb. Lake Superior, 19¼c.; and 25,000 lb. do., at a private price.

TIN.—The stock of Straits Pig is very light and in few hands, and, with considerable inquiry, prices have further advanced and still retain an upward tendency; sales have been made of 1,200 pigs at 36@37c., now held at 37½@38c.; and 2,000 do., to arrive, on private terms. English is also rather higher; 25 tons have been taken at 35½@35¾c. Banca is offered more freely, and the late extreme quotations are not sustained; 100 slabs on the spot, and 650 do. to arrive and for future shipment, sold at 40c., all the above gold. Tin Plates are in moderate jobbing demand at unchanged prices; we notice sales of 300 bxs. Charcoal Terne at $7 62½; and 500 do. $7 75, both gold.

STEEL.—We hear of no transactions. Our quotations are merely nominal.

SPELTER.—There is no inquiry, and our quotations are nominal.

ZINC.—American Ox. Zinc, 6½c.; French do., 7c.; Sheet Zinc, 10c.

MANGANESE.—Lump, 4½@5c.

Mining Stocks.

NEW YORK, June 2, 1870.

Mining stocks are firmer and prices seem to have touched bottom. Sales of Black Hawk were effected this P. M. at 28c., and at the Second Board sales of Smith and Parmelee are reported at $1 05; 500 Consolidated Colorado sold this A. M. at 6. Reference to our quotations elsewhere will give the condition of the market to date.

Petroleum is depressed. Home is quoted at $3 60 and United Petroleum Farms at 20c., a considerable falling off from our last quotations. Below is the atest from the Stock Board:

	Bid.	Asked
Benneboff	30	—
Bergen Coal and Oil	40	—
Bliven Oil	40	—
Brevoort	1 00	1 20
Buchanan Farm	45	—
Central	62	65
Home Petroleum	3 60	—
N. Y. & Alleghany	1 95	3 25
Northern Light	—	—
Pithole Creek	1 30	—
Rathbone	30	—
Rynd Farm	31	—
Second National	—	—
Blood Farm	—	—
United Petroleum Farms	20	—
United States	75	—

San Francisco Stock Market.

SAN FRANCISCO, May 31, 1870.

We have not much change to note in the quotations of stock in the San Francisco Stock Board. Sales of stocks during the week have aggregated $1,307,000, which is considerably above the average. Below is the latest report by telegraph; the most noticeable change of which is Kentucky and Imperial, each being quoted $10 less than per last report:

	1st Board.	2d Board.
Savage	31¼	—
Crown Point	15½	—
Yellow Jacket	48	—
Kentucky	41½	—
Chollar Potosi	28	—
Gould & Curry	1 20	—
Ophir	16	16½
Alpha	—	—
Belcher	19	—
Imperial	28	—
Hale & Norcross	—	—
Amador	200	—

The Slate Trade.

NEW YORK, June 3, 1870.

The market this week still preserves the quiet state noted in our last, with quotations unchanged. From our correspondent at Poultney, Vermont, we learn that 85 car loads, or about 3,000 squares, were shipped from this station during the month of May. This exceeds by one-half the amount shipped in any previous month, and it is hoped that the shipments for the next month will reach 100 car loads. One hundred and seventy-five squares have just been shipped to London, England, partly as an experiment and partly with the idea of getting up a trade in this line. This is quite a novelty in the trade, and seems very like sending coals to Newcastle; and yet as that is successfully done, this may be done also.

Prices range from $1 50 to $10. Freights from all stations on the R. & S. and Rutland & Washington Division to Troy, Albany and Schenectady are $2 50 per ton. Our correspondent says: "Our slate business is looking tip-top, and producers are hoping to sell all they can manufacture."

Shipped from Poultney, Vt., by Rensselaer & Saratoga R. R. for the month of May, 3,000 squares.

[Corrected weekly.]

PRICES OF ROOFING SLATE.

(A "square" represents 100 superficial feet.)

Vermont purple, 1st quality, per square	$9 50@10 50
" green, 1st " "	9 50@10 50
" red, 1st " "	15 00@16 00
" variegated, " "	8 5 @ 9 50
Pa. b'k and d'k blue, 1st qual., "	7 00@ 8 00

Shipments of Slate over the Lehigh Valley and Lehigh and Susquehanna R. R., and the Lehigh Canal,

For the week ending May 28, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Locke Slate Co.	525 squares.
Jones & Williams	280 "
Kuntz & Woodring	175 "
Saylor & Morgan	175 "
Girard Slate Co.	140 "
Lehigh "	105 "
R. P. Jones	105 "
D. Thomas	70 "
D. Williams & Co.	35 "
W. L. Hughes	35 "
Keystone Slate Co.	35 "
Hope "	35 "
Total	1,715 "

MANTELS.

Lehigh Slate Co.	2 cases.
Yerks & Martin	2 "

SCHOOL SLATES.

D. Williams	90 cases.
Lehigh Slate Co.	12 "
A. W. Lerch	34 "

BLACK BOARDS.

Lehigh Slate Co.	5 cases.

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Thos. W. Parry	140 squares.
Twin City Slate Co.	120 "
Heinbach " "	70 "
Eagle " "	70 "
Mauch Chunk Slate Co.	50 "
J. M. Coffin & Co.	40 "
H. W. Harper	35 "
Welch & Co. and Continental Slate Co.	38 "
Total	563 "

LEHIGH CANAL.

ROOFING SLATE.

Heinbach Slate Co.	247 squares.
Eagle " "	175 "
Total	422 "

	Week.	Previously.	Total for Year.
L. and S. R. R.	563	1,954	1,617
L. V. R. R.	1,715	2,845	4,560
Lehigh Canal	422	—	422
Total	2,700	3,899	6,599

New Steel Manufacture.

KEEPING in view the importance of Pennsylvania's great staples, coal and iron, and the various products of the latter, we have from time to time, as new developments and discoveries have been made, laid them before the readers of this journal. For several years past, the most active efforts of our "iron men" have been directed towards the discovery of methods for simplifying and cheapening the processes for the production of malleable iron and the manufacture of steel in large quantities, and making them come as directly as possible from the crude ore. The means proposed for accomplishing this great desideratum have been numerous and various, and we believe all of them have been noticed in this journal. Most of them have been of foreign origin. Now, however, we have a new development in our own State. A large deposit of iron ore of a very peculiar nature has been recently opened up in York county, Pa. This ore, we are informed upon good authority, has the quality of turning pig-iron into good merchantable steel, by simple mixture and manipulation with the pig-iron in a puddling furnace of the ordinary construction. The proportion of the ore used must of course vary according to the quality of the pig-iron and the quality of the steel desired; but experience thus far seems to prove that with eighty per cent. of good iron, twenty per cent. of the ore in question will produce quite a fine quality of steel. Those acquainted with the processes for making steel, even by the most approved modern methods, will of course accept the above statements of the curious and valuable influences of this newly discovered ore, with reserve, as we do ourselves; but the facts seem to be thoroughly vouched for as they come to us. The ore, as we are informed, has been tested in the presence of experienced manufacturers, in the "Abbott" rolling mills, in Baltimore; the "Cambria" iron works, at Johnstown, Pa.; the "Lochiel" iron works, near Harrisburg; the "Tamaqua" rolling mills; "COLEMAN, RAHN & Co.'s" works, at Pittsburgh; the "Alliance" rolling mills, at Alliance, Ohio, and at other places; and in all cases it has been shown to possess the remarkable quality claimed for it. The steel produced during these tests was generally used for making steel-capped rails, and one of these bars, made at Pittsburgh, was shown to possess a tensile strength of 112,500 pounds to the square inch of cross section.

All this appears to be as valuable as it is remarkable and thus far unaccountable. The chemical analysis of the ore shows the presence of considerable quantities of manganese, silicon and aluminum with the iron. The ore is soft and friable in the bed, so much so that it can be mined with the spade, but upon exposure to the atmosphere it soon hardens. Professor LESLEY, who has examined the ore bed, estimates the contents at 17,000,000 tons. For a few months past the discovery has made quite a stir among the iron furnaces and rolling mills of our state and Maryland, and there is quite a strong desire to know more of a matter that seems to promise such important results. We do not yet understand, however, how a homogeneous quality of steel can be made certain by manipulation in a puddling furnace.—*Phila. Ledger.*

The Difficulty at Summit Hill, Pa.

IN answer to the card of Mr. JOHN T. WILLIAMS, President of the W. B. A. Executive Board, Mr. E. W. CLARK, President of the Lehigh Coal and Navigation Company, replies as follows in the Mauch Chunk *Gazette:*

"OFFICE OF THE LEHIGH COAL AND NAV. CO.,
"PHILADELPHIA, May 18, 1870.

"DEAR SIR: We are very glad to avail ourselves of the opportunity offered by the publication of Mr. WILLIAMS' letter in your last issue, of giving a statement of the company's position in the present contest with its miners.

"We desire it to be understood that we have no contest whatever with any of our men but the miners. The rates of wages of every other class are agreed upon, and that comparatively small body of men is keeping all of our works idle in order that they may force the company to pay an advance on the very high rate paid last year. We notified the men early in February last, that we could not afford to continue the prices we were paying, and must be placed on an equality with the Beaver Meadow region. After being idle for some weeks, they came to us and stated that the Beaver Meadow rates, while reducing labor, would give them an advance of nine (9) per cent. for cutting coal, and if we would concede that advance they would resume work. We did not so understand the Beaver Meadow terms, and our mining engineer offered to go to that region with a committee of the miners and investigate the subject with them. This they declined.

"The coal veins in the different Lehigh regions vary in size and character, and the mode of working and settling with the men is not uniform. The offer to give us 'the same number of feet for the same money,' as in the Beaver Meadow region, would be fair if it included all of the expenses of mining and preparing the coal; but it is not fair for cutting coal only, because we pay for work not paid for there, and have various expenses and disadvantages for which the compensation is the size and easy working of our vein. This has always been allowed for, and there was a well established difference in the rate paid for cutting coal between the two regions for many years previous to the organization of the W. B. A. We lost our relative position during last year, and must now regain it. We seek to secure terms that will enable us to mine our coal as cheaply as other Lehigh operators, and the prices we offer will give to our miners as high wages as are earned anywhere else in the coal regions. The accompanying tables will show the earnings of our men from July to December, inclusive, last year, and we think those of the miners by the car were higher than the earnings of miners elsewhere.

EARNINGS PER DAY OF LABORERS IN THE MONTHS OF—

	July.	Aug.	Sept.
Miners working for company	3.49	3.83	3.54
Inside laborers	3.17	3.50	3.24
Outside "	2.66	3.00	2.75
Do. " No. 2	2.58	2.91	2.67

	Oct.	Nov.	Dec.
Miners working for company	3.50	3.75	3.25
Inside laborers	3.16	3.41	2.91
Outside "	2.66	3.00	2.75
Do, " No. 2	2.58	2.83	2.83

MINERS BY THE CAR.

	No. of days breaker worked.	Monthly aver. earnings of each miner.	Daily aver. aver. of each miner.
Operation No. 1	135½	$126 16	$5 50
Do. 2	134½	148 50	6 64
Do, 3	140½	134 93	5 75
Do. 4	137	135 24	5 02
Do. 5	130½	158 28	7 28
Do. 6	131¼	123 72	5 66

The tables of earnings of the miners working by the car include all who were employed four months and over in the Summit mines. They are all supposed to have worked every day the breakers were in operation. None worked a greater number of days than we have assumed, and very few could have been in the mines so many days. The earnings are net, after deducting laborers' wages, all supplies, and rent and coal.

For the information of parties not familiar with the subject we will state that the miners rarely spend more than seven or eight hours a day in the mines, and probably do not work more than five or six hours. Estimating a day's work at six hours, very few of our miners earned less than a dollar for every hour they worked from July to December, 1869, inclusive, and this will explain to consumers of coal why they were compelled to pay such high prices during that period. Very respectfully,

E. W. CLARK, President.

Fire Works for the Fourth of July.

Our readers, who desire to properly celebrate this anniversary of our national independence will find everything they require in the fire-works line in the circular of Messrs. T. J. SCHAFFENBERG & Co., of 14 Clymer street, Brooklyn, E. D., and which are offered at unusually reasonable prices. We understand that the care taken in the preparation of these fire-works is such as to insure the fact that they *will not* stand fire, but are sure to go off every time, which is quite a desirable notification, in consideration of the fact that for years back most of the American fire-works offered in the market have been miserable trash. Displays of every description, and to suit the pockets of all, can be furnished, and sent to any part of the country with perfect safety. ROBT. FOULDS, John street, and Messrs. A. WEIDMANN & Co., 248 Grand street, this city, are the New York agents for these celebrated fire-works.

The Big Horn Expedition.

ACCORDING to the Montana *Capital Times:* "Large numbers have already concentrated at Cheyenne, to join the Big Horn Expedition, and more were constantly arriving. The prospects were that, by the time it is ready to move, its members will number several hundred more than was anticipated by the managers of the expedition."

Liquid Fuel for Locomotives.

WE reproduce from VAN NOSTRAND'S *Magazine* for January the following paper on this subject, by M. ST. CLAIR DEVILLE, whose practical experiments on this subject cannot fail to interest many of our readers :

MR. PAUL ANDROUIN has constructed a fire hearth by which the problem of the use of petroleum or other kinds of mineral or coal oil for heating furnaces or boilers has been solved to perfect satisfaction. This fire-hearth is a simple chamber of masonry, with a brick bottom, on which the oil is dropped slowly through pipes, provided with cocks to regulate the supply of oil. The air required for burning the oil is admitted through the holes of a perforated plate of fire-brick, standing upright, and forming the back wall of the chamber. I have replaced this plate by a strong cast-iron plate of ordinary construction, which makes this apparatus more solid and more convenient without altering its principle.

MR. DUPUY DE LOME and myself have used this improved apparatus with success for heating a tubular boiler on the French Imperial yacht Puebla. This boiler, when heated with petroleum, produced an effect of sixty horse-power. We have proved by our experiments that petroleum is the most manageable, and, for Paris and many other places, even the cheapest kind of fuel.

Shortly after the completion of these experiments, which were made in March and April, 1868, Mr. Sauvage, Director of the French Eastern Railway, had the locomotive No. 291 put at my disposition for further trials with liquid fuel. Assisted by Mr. Dieudonne, I made the necessary alterations in the construction of the fire-hearth of this locomotive, so as to make it fit for being heated with mineral oil. This was not a very easy task ; for the combustion chamber had to be simple in its construction, occupying as small a space as possible, and had to be constructed without brick walls or arches, which, in a machine so subject to violent concussion as a locomotive, would have involved serious dangers. Also, the quantity of oil to be burnt hourly in a locomotive of 300 horse power is so considerable, and the space available for its combustion is so comparatively small, that the conditions under which the combustion was here to take place are entirely different from those existing in the preceding experiments. I solved the problem in the following manner :

1. I first experimented on a vertical grate, consisting of a row of upright bars, hollow, but open in front on the whole of their length, each grate-bar thus resembling an upright cast-iron channel. The oil is poured slowly from above into the interior of the bars, where it is evaporated by the heat existing in the fire-place. The vapors thus produced are burnt immediately in escaping from the bars, by the air which enters between the bars. The effluence of oil and air must be regulated in such a manner that the vapors burn without smoke, and that not more air is admitted than is necessary for the combustion. This condition is very important. For the principal advantage of the use of liquid fuel, in regard to economy, lies in the possibility of effecting a complete and perfect combustion by exact regulation, an advantage which liquid or gaseous fluid has over any kind of solid combustible.

2. The thicker and stronger the grate bars, the better will their inside be protected against the cooling influence of the air, and the more rapid will be the evaporation of the oil. The thickness in cast-iron of the bars has to be found by experiment for each kind of oil. It must be such that the oil, in running down along the interior walls of the bars, is entirely evaporated before it reaches the lower end of the bars.

The combustion effected by this grate produces a lively but very short flame, only one-fourth of a meter in length. At a greater distance than this the gases are invisible though very hot, as is proved by the immediate incandescence of a strong platinum wire when held into them. This seems to show that the completeness of the combustion, and consequently the absence of all carbon, is the cause of the invisibility of these gases. They may, in this respect, be compared to the exterior part of the flame produced by a blow-pipe.

3. Whenever it is desirable to increase the surface on which the oil is evaporated, without increasing the size of the apparatus, the grate has to be laid down in an inclined position. Thus the oil has to run a longer distance, and the quantity of oil evaporated during a certain time is more considerable. The draught of the stack has then to be augmented in proportion to the greater vivacity of the combustion, so as to make the latter complete and perfect.

This kind of apparatus has to be adapted for heating locomotives with liquid fuel ; the grate may be placed in an inclined position in the ash-pit. The bottom of the apparatus may be made of copper, hollow, and filled with water, or arranged in such a manner as to form a part of the boiler. It is, in this case, advantageous to give the whole apparatus the shape of a cylinder, to avoid all even surfaces, as well as stay-bolts in the interior of the fire-box. The oil enters through a number of holes provided in the upper part of the grate ; it then runs down over the grate, at the lower end of which a cast-iron projection prevents that part of the oil which might not have been evaporated from coming in contact with the bottom. The locomotive 291, which I used in my experiments, did not have so perfect an apparatus, not being specially constructed for the purpose. The grate had there to be placed in front of the ash-pit. The latter was closed by an iron plate, which was covered and protected by a brick plate. The iron frame below the fire-bridge had to be protected by a brick mantel resting on an arch of fire-brick. This temporary arrangement stood very well in the trials, and was not in the least affected either by the heat in the hearth or the shaking of the engine, although the bricks were not of superior quality, and although the engine moved at a speed of 60 to 70 kilometers (=37 to 43 English miles) per hour. The distribution of the oil over the grate is regulated by a single graduated cock. Mr. Brisse, second director of the railroad machine shop at Epernay, has replaced this cock by a quite simple apparatus, of which, however, I am not allowed to publish a detailed description. The principal feature is a screw with a graduated head, placed within the reach of the engine-driver.

The draught in the chimney is effected in the ordinary way by the action of the blow-off pipe.

Whenever mineral oil is used in the right way, neither smoke nor cinders are produced. When the locomotive runs at a high speed, the draft effected by the blow-off pipe is so strong that the consumption of oil, and consequently the production of steam, can be increased at pleasure without producing any smoke.

The regulation of this fire by means of a single cock is so easy a work that it can be done by the engineer in addition to his other duties. The appearance of the gases which escape from the chimney serves as a guide in this operation. The gases must have a slight yellowish tint, which shows that they do not contain an excess of air.

A self-acting mechanism can be applied to the cock to prevent all fatal consequences which might arise from sudden and vehement concussion produced by some accident. This mechanism would shut the cock and extinguish the fire at once, thus rendering a conflagration impossible, which has often originated under such circumstances, and proved highly disastrous with locomotives heated by coal.

I must here remark that only the heavy and thick flowing kinds of mineral oil or petroleum, which are less inflammable, can be used to advantage for heating locomotives. The oil is tested by being heated to 100° Celse, after which a well lit link is dipped into it. If the oil is of the proper kind, the link will not set fire to the oil, but will itself be put out.

Genetic Relations between Pozzuolana, Trass and Santorin-Earth.

Translated from "Die Hydraulischen Mörtel," of Dr. W. MICHAELIS.

BY ADOLPH OTT.

GEOLOGICAL investigations, especially those at Vesuvius and on Santorin, have settled the fact, beyond doubt, that these tufas belong to the trachytic series. In Italy and in the Ægean Sea they seem to be subaqueous formations, and this hypothesis is rendered, at least, highly probable by the recent volcanic eruptions on the Santorin Islands.

Trass, pozzuolana and Santorin-earth owe their origin chiefly to submarine eruptions. From the fact that those of Vesuvius and the Eifel include carbonized organic substances, it is not impossible that eruptions of ashes have taken part in their formation, or that mud-lavas from craters above the sea have discharged themselves over them.

During the manifold depressions and elevations of the crust of our earth, deposits of ashes have been subsequently altered in their nature by immersion to such an extent that they have become perfectly assimilated to subaquatic formations. But, whatever opinion we may entertain concerning the origin of these pozzuolanas, it appears to be certain that they are very similar to each other in regard to their origin as well as their nature.

It would lead us too far, if we would explain in detail the relations between trachytic rocks and the obsidian pumice and pearl stones and tufas that are derived from them. We refer the reader to the interesting investigations of ABICH on this subject, and confine ourselves to showing, by some average analyses, how nearly all these minerals are related to each other, after which we shall endeavor to develop how the tufa can play the part of a "hydraulifactor" by its very process of formation.

The massive rocks, which serve as foundation to the crater-ruins in the Eifel, on Santorin and on Vesuvius, and as scaffold to the several eruption-cones, do not always belong to the trachytic formations.

From the work of ABICH, "On the Nature and the Relations of the Volcanic Formations," Braunschweig, 1861, we extract the following analyses of rocks of this formation :

	Trachytic porphyrics.	Trachyte.	Normal tractyte.	Phono-lite.	Piperno.	Andesite.
Silicic acid	68.35	67.09	76.67	57.66	61.71	65.09
Alumina	13.92	15.63	14.23	19.66	19.24	15.58
Oxide of iron and manganese	2.28	4.97		4.17	3.51	5 76
Lime	0.84	2.25	1.44	1.01	1.19	2.61
Magnesia	2.20	0.97	0.28	1.53	—	4.10
Potassa	3.24	3.56	3.20	6.98	5.50	1.99
Soda	4.29	5.07	4.18	6.06	7.38	4.46
Sulphuric acid,* Hydrochloric acid, Water.	4.64	0.45	—	2.33	1.43	0.41

* Loss in heating.

In order to compare herewith the obsidian pumice and pearl stones, we append the following analyses from the same source :

	Obsidian of Teneriffe.	Pumice stone of Teneriffe.	Pumice stone of the island of Fernandina	Pumice stone of the island of Ischia.	Obsidian of the island of Procida.	Pumice stone of the Campi Flegraei.	Pumice stone of the island of Pantellaria	Pumice stone of the island of Santorin.	Pumice stone of the island of Lipari.	Obsidian of the island of Lipari.
Silicic acid (Titanic acid)	61.18	62.25	62.53	62.29	62.70	62.04	69.34	69.59	73.70	74.05
Alumina	19.05	16.43	17.37	16.89	16.98	16.55	8.21	12.31	12.27	12.97
Oxide of iron (Ox. Manganese)	4.55	4.49	8.34	4.15	5.37	4.43	8.23	4.66	2.31	2.73
Lime	0.95	0.62	1.46	1.24	1.77	1.31	0.14	1.68	0.65	0,12
Magnesia	0.19	9.79	4.02	0.50	0.82	0.72	0.37	0.68	0.29	0.28
Potassa	3.50	2.97	1.82	3.98	4.35	3.66	1.60	2.02	4.73	5.11
Soda	10.63	1.25	2.85	6.21	6.09	6.39	8.32	6.69	4,52	4.15
Water Chlorine, etc.	0.34	0.53	1.63	3.89	1.28	3.84	3.09	2.93	1.53	0.53

From these analyses, as well as from those already given, we may conclude that the original trachytic rocks form an intermediate member, and that, therefore, a separation into acid and alkaline silicates must have taken place. To the former belong the pearl stones, obsidian and pumice stones ; to the latter, he tufas.

It will be especially noticed that they are of the same origin, if the composition of the andesite in the formations of Santorin, where it occurs as massive rock, is compared with the pumice stone and the tufa that overlie it.

	Andesite.	Pumice stone of Santorin.	Santorin earth.
Silica	65.09	69.79	68.50
Alumina	15.58	12.31	13.31
Oxide of iron (Oxide of mangenese).	5.76	4.66	5.50
Lime	2.61	1.68	2.36
Magnesia	4.10	0.68	0.73
Potassa	1.99	2.02	3.13
Soda	4.46	6.69	4.71
Water, Chlorine, etc.	0.41	2.93	1.76

From this it follows that the tufa and the semi-vitrified lavas consist only of the various stages of development of one and the same rock, namely, the andesite, a hypothesis, which, if not evident at first sight, seems to be also fully justified when the other volcanic products are taken into consideration.

It has already been remarked, that pozzuolana and trass are decomposable by acids to the greatest extent, and Sartorin earth in a less degree. This property, in connection with the water existing in all of them, proves that the silicates referred to have already passed through a process of decomposition, a metamorphosis, in consequence of which they were more readily acted upon by chemical agencies.

The quantity of water contained in them is so great in their fresh state, that we are bound to consider it as partly combined with silica, alumina, and oxide of iron—partly as a component part of zeolitic bodies. For this latter view speaks the analogy with the basalt, in the interior of which zeolitic particles are distinctly recognizable.

The Gold Fields of Nova Scotia.

From the correspondence of the London Mining Journal.

ALTHOUGH the returns for 1869 show a falling off in the gross yield compared with the preceding year, the steady average per man and per ton establishes, beyond doubt, the profitable and permanent character of the gold fields of Nova Scotia.

There is no time by the present mail to give a detailed review, but the decreased yield may be explained by the fact that operations were conducted on a less extensive scale, and no beds of exceptionally rich ore were encountered, as in the years 1866 and 1867. Several Canadian companies, too, who had organized an insufficient capital, were obliged to close their works until a better time prevails in the money market, and other properties were shut down pending negotiations for their transfer.

Only one property, the Westminster, at Laurencetown, was successfully disposed of in England. Another, at Musquodoboit, that would have given an excellent account of itself, and proved a very remunerative investment at the price at which it was offered, was all but sold, when the interference of a person put forward by a member of this Government, as Commissioner for Mines in London, and claiming to have a pre-emption of the property, summarily terminated negotiations. In justice to the owner of the property, and the parties who offered it to the public, it must be stated that the Government broker had no bond, and that his interference was unwarrantable.

The declared returns for the whole province total was as follows to the end of 1869 :

Year.	Gold yield. Oz. dwt. gr.	No. of miners daily.	Quartz crushed. per 100 lbs.	Aver. per ton of 2,240 lbs. Oz.dwt.gr.	Annua earnings per man,
1862	7,275 0 0	500	134,800	1 3 2	$291 00
1863	14,001 14 17	877	340,035	0 18 10	319 30
1864	20,022 18 13	810	428,700	1 0 20	494 36
1865	25,454 4 8	683	500,025	1 3 6	745 76
1866	25,204 13 2	679	635,387	0 17 13	742 56
1867	27,3:4 11 11	702	666,429	0 19 10	778 66
1868	20,541 6 10	774	678,817	0 14 6	530 84
1869	17,868 10 10	676	708,486	0 11 5	528 64
Total	157,682 9 8	*713	4,092,679	*0 15 10	*553 90

* Mean.

Of the above, only 873 ozs. 7 dwts. 18 grs. was alluvial gold, the rest having been obtained exclusively from quartz crushings. Allowing 6,000 ozs. as the product of 1860 and 1861, before records were kept, and about 10 per cent for quantities not declared or stolen in the mine, (an estimate much below the real amount,) the gross yield of gold in Nova Scotia during the past ten years, has been 180,000 ozs., representing, in round numbers, a value of £720,000 sterling.

March returns are not yet to hand, but, in the meanwhile, the subjoined results for the year 1869, and for the month of February, will prove useful, and comments will follow by another post.

ACADIENSIS.

HALIFAX, N. S., April 8.

GOLD PRODUCT, FEBRUARY, 1870.

District.	Gold yield. Oz. dwt. gr,	Quartz crushed.) (Colonial weight,. Tons.
Sherbrooke	309 0 0	694 03
Tangier	135 7 20	88 00
Oldham	104 7 14	200 07
Waverley	78 7 0	141 00
Renfrew	71 2 0	223 10
Musquodoboit	52 5 21	73 10
Uniacke	47 2 4	105 00
Wine Harbor	28 7 12	100 10
Isaac's Harbor	2 11 15	3 10

NOVA SCOTIA GOLD PRODUCT, 1869.

District.	Gold product. Oz. dwt. gr.*	Ave'ge miners daily.†	Quartz crushed. Tons cwt‡	Aver. per 2000 lbs. Oz.dwt.gr§	Annual proportion per miner.‖
Sherbrooke	5546 11 16	134	11,500 00	9 15 5	£165 11 6
Renfrew	3097 15 7	112	7,258 09	8 12 8	110 12 9
Uniacke	1867 3 12	71	3,171 13	11 18 6	105 3 10
Waverley	1591 14 10	54	3,915 15	8 3 9	117 18 1
Oldham	1394 16 0	56	1,735 02	16 1 9	99 12 7
Musquodoboit	1001 0 23	36	1,582 17	12 15 6	111 4 7
Montague	805 13 14	29	572 07	1 8 37	111 2 7
Wine Harbor	719 8 19	65	2,726 12	5 6 6	44 5 6
Unclassified	394 11 19	29	622 09	6 23 0	54 8 7
Isaac's Harbor	227 0 13	19	784 00	5 19 0	47 15 11
Laurencetown	30 0 20	20	223 00	2 16 7	6 1 8
Total	17,686 0 19	676	35,426 06	9 23 8	£105 14 7

* Including 177 ozs. 18 dwts. 11 grs. alluvial gold from unclassified districts.—† Allowing 312 working days to the year.—‡ Colonial tons of 2,000 lbs.—§ Per colonial ton.—‖ Valuing the ounce at £4 sterling.

THE ENGINEERING AND MINING JOURNAL.

CONTENTS FOR THIS WEEK.

[*Illustrated Articles are marked with an asterisk.*]

*Swain's Patent Turbine Water-Wheel..... 353
Operations at Hell Gate..... 353
The Ship of the Future—Shall it be Wood or Iron?..... 354
Letter from Mr. A. Mezger, M.E., on the Calcasieu Country, La.. 355
A New Gunpowder..... 356
Skilled Workmen Coming to America..... 356
MINING SUMMARY..... 356
BUSINESS AND PERSONAL..... 357
MARKET REVIEW..... 358
THE SLATE TRADE..... 359
New Steel Manufacture..... 359
The Difficulty at Summit Hill, Pa..... 359
Fire-Works for the Fourth of July..... 359
The Big Horn Expedition..... 359
The Gold Fields of Nova Scotia.. 360
Liquid Fuel for Locomotives.... 360
Genetic Relations between Pozzuolana, Trass and Santorin-Earth..... 360
EDITORIALS:
The Croton Aqueduct..... 361
California Tin..... 361
Calcasieu..... 361
The Solubility of Carbolic Acid 361
The Darien Canal..... 361
The Cooper Union Schools.... 361
NEW PUBLICATIONS..... 362
Silver Mining in Peru..... 362
Polytechnic Club of the American Institute..... 362
Emigration of Welch Miners and Iron-Workers..... 362
Mining Companies and Stock Quotations..... 363
ADVERTISEMENTS..... 363

ROSSITER W. RAYMOND, Ph. D., Editor.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

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WESTERN & COMPANY,

Publishers and Proprietors,

37 PARK ROW,

NEW YORK CITY.

P. O. Box, 5969.

The Croton Aqueduct.

In the organization to which our various municipal departments have recently been subjected, it is pleasant to note how many excellent appointments have been made. Whatever may be the lapses of human weakness in the future—and certainly politicians are as likely to fall as any other kind of sinners—it certainly appears that the authorities of our new *regime* are determined not to let the standard of excellence in the best-managed departments drop from the high position where it was planted by their predecessors. We had occasion the other day to bestow a few words of merited praise upon the Fire Commissioners; and we can cordially do the same for another and equally important branch of the public service.

On the first of May Mr. EDWARD H. TRACY, having taken the oath, and executed the bond required by law, assumed the position of Chief Engineer of the Department of Public Works. This is no new office to him. He was the first to discharge the duties of Chief Engineer of the Croton Aqueduct after the aqueduct was sufficiently complete to be used in furnishing water to New York, and long before that time, he was occupied in superintending the construction of that portion of it which lies between Fordham Church and Manhattanville, including the famous High Bridge over Harlem River. From the building of the foundations to the final laying of the pipes, this important work was under his charge; and the period of these operations, together with that of his administration as Chief Engineer, makes an aggregate of fourteen years, during which Mr. TRACY, was identified with the Croton Aqueduct. His previous career had been that of an assistant upon the Chenango Canal; and the transfer of so young an engineer to positions of so great responsibility was, perhaps, a daring step on the part of Mr. JERVIS, who was his chief in both places, and who learned on the Chenango Canal to appreciate his ability and fidelity. But the results fully justified the judgment of Mr. JERVIS; and when that gentleman retired from the position of Chief Engineer of the Aqueduct, it was Mr. TRACY who succeeded to that honorable post.

In 1852 he resigned this position, and became for two years a partner in the Morgan Iron Works, and manager of its manufacturing department. In 1854 he received a tribute to his acknowledged ability from abroad, in the form of an engagement from the Canadian Government to make the surveys and plans for a ship-canal between the St. Lawrence and Lake Champlain. He subsequently carried out a somewhat similar enterprise for the State of Iowa, in establishing slack-water navigation on the Des Moines river. His fame being thus confirmed in the West, he was employed in making the surveys of the rapids in the Mississippi River for the Rock Island and other railroads. These surveys were of great importance, as they proved the necessity of the railroad bridge at Rock Island, a matter which was strongly denied, and only settled in favor of the companies after severe litigation, in the course of which Mr. TRACY appeared as an expert, and successfully defended his work, and the conclusions to which it led.

He had charge, under the State Commissioners, of removing the obstructions of Macomb's Dam, in Harlem River, and of the erection of the Central bridge on the site of the old dam—a work which he accomplished with notable economy, the whole cost, aside from legal expenses and right of way, being less than $60,000.

We have also known Mr. TRACY as the energetic and accomplished engineer of the Cumberland Coal and Iron Company. This company possesses a very extensive and valuable property, which was exposed, during the war, to frequent and destructive rebel raids, calculated to greatly discourage less determined managers than those at its head. The risks and disturbances of war were thus added to the cares of real estate, mining, smelting, canal and railway construction, and every variety of engineering operations, as well as the commercial management of so vast an interest. We venture to say, that this experience was a laborious and severe training, even to a man who had achieved so much already; and having successfully lived through it, Mr. TRACY may be considered as pretty thoroughly graduated. Most of us, when we have accomplished as much as this, are about worn out; but our friend, whose distinguished career we have briefly sketched, is still younger than most men of his reputation, and stronger than most men of his age. We welcome him back to the sphere of his early achievements, and congratulate the city and its governors that among our own townspeople they have found a man of wide experience and untarnished fame, to accept the high trust they have conferred upon him. Illustrious engineers have occupied this position since Mr. TRACY held it before, but it has never been more worthily bestowed than now.

California Tin.

THE San Jacinto tin mines, about which so much has recently been said, include the old Temescal mines, formerly opened by PHELPS, DODGE & Co., and others, of this city, and abandoned by them for various causes, prominent among which were insecurity of title and disagreement among owners. We have for many years maintained the importance and value of this deposit of tin ore. The late lamented Dr. JUSTUS ADELBERG examined the locality ten years ago, and convinced himself of the extraordinary excellence and probable abundance of the ore. Subsequent professional visitors were deceived, either by the peculiar appearance of the tin-stone itself, or by the representations of parties interested in the struggle for the title, and pronounced the occurrence limited and valueless. ADELBERG's judgment is now vindicated, even to the point of location chosen by him for a shaft; and the vertical shaft which he began is now employed by the company operating the mine.

We print in another column a letter from Mr. ROBINSON, general superintendent, and some extracts from the annual report. With every desire, as we have said, to see this enterprise succeed, and with much faith in its success, we must confess that the demand of Mr. ROBINSON for an increased tariff on pig tin, is scarcely borne out by the facts set forth in his letter or in the report.

In the first place, he claims that his mine can furnish "all the tin that the United States may require for the present." Yet all the tin-ore now accessible in the mine, and which it is not pretended can be extracted, reduced and put in market without the erection of proper works and the expenditure of considerable time, is less than one-seventh of the annual consumption of pig-tin alone by the United States. The trades and industries consuming pig-tin are asked to contribute three hundred and thirty thousand dollars, in order to help the San Jacinto mine to the extent of forty eight thousand dollars. It would be wiser, and easier, to take up a collection among the tinkers, at once. But does the San Jacinto company need this pittance? According to its own statement, it expects a profit of three hundred and five thousand dollars without any such help.

The argument is often advanced in favor of protection, that it draws hither skilled labor and capital. This is true in the case of great industries, for which both the market and the supply of raw material are extensive. But what can Mr. ROBINSON do with his swarming skilled laborers and millions of capital, coming over to work tin mines? There is only one such mining district discovered, and it belongs exclusively (according to the report) to the San Jacinto company.

No doubt it will be a pleasant thing to point with pride to our American tin kettles and to our crackling California bars; and this we shall be able to do, without doubt, whether a new duty is laid on imported tin or not. But we do not hesitate to say, that if the extra protection asked for were necessary (as it is not) it should not be given. The manufacturers of the Atlantic States very naturally think that California is far enough away from Cornwall and Saxony and the Dutch East Indies to do without artificial protection against those countries. We cannot afford to coddle a tin mine in California, in order to maintain the exorbitant rates which Cornishmen in that State demand for their labor. Let Mr. ROBINSON and his company go ahead, and make their three hundred and five thousand dollars on the ore in sight. If they find out that they have not made so much, let them inquire what in the name of common sense their mining captain means by reckoning the costs of extraction of ore from a depth of one hundred feet, out of a seven-foot vein, at fifteen dollars gold per ton. That sounds to us very much like paying the dividends to the laborers instead of the owners: and if it should result in a net loss, we would prefer a slight reform at the mine to a legislative remedy at Washington.

To sum up: we believe the San Jacinto mines to be valuable, and we think they need no help from the government. If with ores exceeding in average richness (according to the report) those of any other tin veins in the world, and with the advantage of a near market, they still need to be protected against the antipodes, then we say it would be better for the country to wind up the concern. But this catastrophe does not impend. Failing to obtain the legislation it requests, this company will go on and prosper without it.

Calcasieu.

WE regret to hear that the operation of sinking the deep shaft, intended to reach and open the sulphur deposits of Calcasieu river has not yet commenced. Our readers have already been informed on several former occasions through the columns of this journal, that this deposit of native sulphur is probably the largest in the United States, and at all events the most important one, since its position, so near the gulf and in close proximity to the renowned Petite Anse rock-salt mines, bids fair to insure for the State of Louisiana in particular, and in fact for the Atlantic States, such facilities for the fundamental chemical manufactures as are not possessed by any other region. A late communication from Mr. A. MEZGER, M. E., who has been engaged to effect the sinking of the contemplated shaft, informs us that litigation and strife of contending parties, which has assumed such proportions as to admit of no settlement except through the courts, keeps him idle at Calcasieu, and that there is little hope of an early adjustment of the difficulty.

It is a deplorable fact, that as soon as the value of a mine has been ascertained and proved beyond a doubt, rival factions will appear on the stage, each striving to secure the prize for themselves alone. Our loose laws in regard to titles, especially in the States and Territories formerly under French or Spanish rule, are only too well fitted to bring on and perpetuate this state of affairs; and the carelessness of capitalists and their frequent disregard of strict business principles in connection with mining properties, is astonishing. We are not informed in regard to the particulars of the case under discussion; but from the fact, that before the boring of the oil-well and the appearance of the excellent report of Professor HILGARD in public, there appeared to be no difficulty about the ownership, we draw the conclusion, that this mine is no exception to the general rule in such cases. We only hope, for the sake of the State of Louisiana and the great number of chemical manufactures, which would derive benefit from the working of the sulphur-beds, that the litigation now going on may not be protracted for years, as has been the case in connection with many of our most valuable mineral properties.

In another part of this issue we publish an extract from Mr. MEZGER's letter, which throws light on many points in connection with the Calcasieu country, not heretofore generally known.

The Solubility of Carbolic Acid.

A CORRESPONDENT calls attention to an incautious statement in our article last week on carbolic acid, to the effect that it is insoluble in water. This statement was incidentally made, to explain the spotted appearance of cloth which had been dipped in a mixture of carbolic acid and water. The fact is, that carbolic acid requires for solution at least thirty times its volume of water, and that, in the experiment referred to, much less than this quantity was taken. The excess of carbolic acid is, under the circumstances, insoluble; and thus our remark, though strictly incorrect, was, for the purposes of the context, true enough.

We need hardly add, that the solubility of carbolic acid does not enter into the question of its permanent effect upon rubber hose. When used in this manufacture, it is intimately mixed with the material, and, furthermore, protected by the layers of rubber from contact with the water. Besides, it is uncertain whether the acid does not form new compounds with the organic materials of the cloth and rubber. This is indicated in the cloth by the change of color. And finally, aside from all theorizing on the subject, the carbolized hose have been exposed to the severest tests of time and use, and it is an unquestionable fact that they possess extraordinary strength and durability.

The Darien Canal.

SOME time ago, before the sailing of the United States Expedition to the Isthmus, we expressed our conviction that no route would be found so feasible for a ship-canal as that by the way of the Panama railroad. We have reason to think that we then underestimated the difficulties of that route, in so far, at least, as the construction of a tide-water canal, without locks, is concerned. Such a canal, though not impracticable, would be enormously costly by any route thus far known; and it would be wiser to submit to the inconvenience of a few locks. But the cardinal fact upon which we then insisted remains, that the existence of the railroad already in operation would, of itself, be an advantage sufficient to counterbalance even superior topographical facilities. And the results of the United States explorations thus far have confirmed our opinion that superior topographical facilities will not be found.

The Cooper Union Schools.

WE hear a great deal of vague talk about scientific and technical education for the people. Every little while, somebody distinguishes himself by attacking our college or public school system, on account of the extremely modest quantity of "useless" knowledge which they venture to inject into their pupils, and by crying out vigorously for that golden time when every one may be introduced into the mysteries of Nature, or trained in the application of science to the arts. Now, the true way to hasten such a consummation is to recognize with appreciation what has already been accomplished in that direction. Many of the critics appear not to know that we have in the city of New York free scientific and art schools, in successful operation under masters of splendid ability, and patronized by crowds of our citizens, and that these schools cannot be equalled as institutions for the diffusion of science among the people, in any other city of the world. We refer to the free classes, reading-room, etc., of the Cooper Union.

The commencement exercises of the Union, and the exhibitions of its art schools took place on the 28th, 27th, and 25th of May. The daily press honored them with brief notices, as

matters of news, but without any apparent appreciation of the great significance of the enterprise they commemorate. The exercises and exhibitions in themselves passed off well, and presented the usual features of interest. But for this part of the story we care little. It is the work of the year, not the display of a single occasion, that marks the true importance of the Cooper Union. We call attention, therefore, to the following record of operations :

THE FREE READING ROOM AND LIBRARY.	TOTAL.
American Newspapers on file, Dailies, 50; Weeklies, 75	125
Foreign " " " 9; " 35	44
American Magazines taken	40
Foreign " "	54
Total number of periodicals taken in Reading Room	263
Number of books in Library, about	5,000
Number of readers in 1869	225,279
Number of books used	17,356

The Reading Room is open from 8 A. M. to 10 P. M., free to all, without ticket or introduction.

THE FREE ART SCHOOL FOR WOMEN.	
Number of pupils during the year	231
Number at close of term	120
Number receiving certificates	62

Open daily from 9 A. M. to 1 P. M. DR. WM. RIMMER, Director.

FREE SCHOOL FOR WOMEN IN WOOD ENGRAVING.	
Number of pupils received during the year	25
Number at close of term	12

WM. J. LINTON, Director.

THE FREE DAY SCHOOL OF TELEGRAPHY FOR WOMEN.	
Number of pupils during the year	82
Number who retired voluntarily	18
Number dismissed	12
Number graduated	31
Number who obtained situations	23
Number waiting situations	2

Average wages earned by female operators per month, from $30 to $70. LIZZIE H. SNOW, Manager.

THE FREE NIGHT SCHOOL OF TELEGRAPHY FOR YOUNG MEN.	
Number of pupils during the year	49
Number who retired voluntarily	17
Number dismissed	4
Number graduated	13

Average wages of male operators per month, from $35 to $125. A. S. BROWN, Manager.

THE FREE NIGHT SCHOOL OF SCIENCE.

CLASSES.	Admitted during the term.	Remaining at close of term.	Number that rec'd certificates.
Arithmetic	85	39	23
Algebra	8	37	13
Plane Geometry	37	9	7
Solid Geometry and Trigonometry	20	5	5
Analytical Geometry	5	5	5
Descriptive Geometry	25	14	8
Differential and Integral Calculus	8	4	4
Theoretical and Practical Mechanics	9	6	6
Natural Philosophy	224	38	32
Mechanical Philosophy & Mechanism	10	6	6
Astronomy	15	6	4
Elementary Chemistry	89	38	25
Organic and Applied Chemistry	38	25	15
Mineralogy and Geology	35	13	13
Mechanical Drawing, (School of Science).	6	5	5
Oratory and Debate	50	30	
Total in School of Science	741	280	171
THE FREE SCHOOL OF ART.			
Perspective Drawing	40	31	27
Drawing from Cast	31	20	8
Drawing from Life	9	8	8
Mechanical Drawing	131	62	29
Architectural Drawing	97	71	16
Free Hand Drawing	600	313	148
Modeling in Clay	50	40	22
Totals in School of Art	958	575	258
Grand Totals	1702	855	429

JOSEPH G. FOX, Director.

Number of persons who have availed themselves of the privilege of free consultation with the Professors of Science, on matters relating to industrial pursuits :

Prof. Charles S. Stone, Industrial Chemistry	160
Prof. George W. Plympton, Mechanics	74
	234

Free Saturday Lectures for the people in the Great Hall, commencing January 8, 1870, by the following-named gentlemen :

Prof. ADRIAN J. ECELL, four lectures on "Zoology."
Prof. J. E. FROBISHER, Readings.
LEWIS SANDERS, Esq., on "The Dignity of Labor."
Dr. G. Q. COLTON, on "Nitrous Oxide."
Dr. H. KNAPP, on "Light and Vision, and especially how Light is converted into Thought."
Dr. LOUIS ELSBERG, on "Hearing, Voice and Sound."
Prof. B. SILLIMAN, on "The Yo Semite Valley."
Dr. C. F. CHANDLER, on "Petroleum."
" " "Water."
Dr. B. I. RAPHAEL, on "The Circulation of the Blood."
CHARLES C. PERKINS, Esq., on "Art Education in the United States."
Prof. B. WATERHOUSE HAWKINS, on "The Age of Dragons, and their Footprints in America."
Prof. R. PUMPELLY, on "The Chinese Question."
Prof. J. S. NEWBERRY, on "Coal."
Dr. J. C. VANDER WEYDE, on "The Relation of Sight to Sound."

Estimated attendance on twenty-four lectures, forty thousand auditors.

FINANCES.

The original cost of the Cooper Union Building when conveyed to the Trustees	$630,000 00
Total Receipts from rents	278,211 00
" " " donations	22,323 27
" " " sundry other sources	4,180 52
" aggregate receipts to Jan. 1, 1870	$314,714 79
" expenditures for carrying on the above departments from 1859 to 1869 inclusive, (11 years.)	$314,500 94

Let these figures be studied by every thinking man ; for they mean much. A library of 5,000 volumes, every one of which is read, on an average, between three and four times a year ; a reading-room containing 263 periodicals, besides the library, and visited by 225,279 readers ; 1,702 pupils receiving instruction, and 40,000 auditors listening to free lectures, at a total expense of less than $44,000. These facts are high praise of the management of the institution. It is no prodigal foundation, supporting a few sinecures, like too many benevolent establishments, but a wise and well-administered organization, in the hands of keen business men, who are determined to make each dollar do a dollar's work in a great cause. No men are so successful in administering such benefactions as those who have a business training, and have proved it by their own success in life ; and it is to be deeply lamented that there are but few who, like the trustees of the Cooper Union, are willing to contribute—what is worth more than their money—their *time* and their *thought*, to the welfare of the common people.

Finally, the venerable founder himself, whose benignant face beamed, and whose weighty words were heard from the platform the other night, may well be glad that he did not wait to leave his wealth merely for such an object ; but that he laid its foundations, and raised its walls, and crowned its success himself. Mr. STEVENS, of Hoboken, founded by his will a magnificent scientific school, which is now in process of organization. We would not detract from the praise justly due to such an act ; but we cannot but feel how much pleasure to himself, and how many chances of the full success of his plan that gentleman sacrificed by postponing his gift to the hour of death. The world will not quarrel with the modes adopted by its benefactors ; but PEABODY, VASSAR and COOPER will be considered better models for imitation than STEVENS or GIRARD.

New Publications.

THE MEN WHO ADVERTISE : An Account of Successful Advertisers, together with Hints on the Methods of Advertising. NELSON CHESMAN, Publisher for GEORGE P. ROWELL & Co., Advertising Agents, 40 Park Row, New York.

THE above is a splendidly-bound volume of some 800 pages In it are detailed the experiences of many of our most successful advertisers, such as STEWART, BONNER, HELMBOLD, BARNUM, and others, which must prove invaluable to all contemplating advertising. It also gives some well-timed remarks upon when, and how to advertise, and the value of placing your business directly before that class of persons who consume or require the article you manufacture or have for sale. We advise all who intend to make fortunes in this world to procure the book, and thereby profit by its teachings.

Silver Mining in Peru.

WE are glad to hear that the silver mining industry of Peru, which had fallen off greatly of late years, by reason of the lack of skill and knowledge to cope with the increasing difficulties of mining, is now steadily improving, under the wise administion of the present Government.

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, May 26, 1870, Professor S. D. TILLMAN in the Chair.

PROFESSOR DARBY read a paper upon Malaria Chemically Considered, and especially in relation to its removal from this city. Some points in relation to malaria were then stated. It is heavier than the air. It is present in minute quantities only. Ordinary analysis will not discover it. To use disinfectants against it is out of the question, as they do not destroy it for any length of time. In a city there are only two things that can be applied to its destruction, and these are ozone and fire. Ozone is always present in the upper regions of the air, and could we bring it down to the ground, we should always have the means of destroying the malaria. As this is impracticable, fire only remains as a method of disinfecting. A calculation which the speaker had made showed that the large factories, sugar houses, etc., of the city, burned much more than two thousand tons of coal per day ; taking one-half of this as a basis for his estimate, it was shown that thirty-six million cubic feet of air were required for its consumption. This is in volume equal to that contained in a tube three feet by four and five hundred and eighty-six miles long. In other words, the furnaces of these establishments would empty a tube of that length and capacity every twenty-four hours, if they drew their whole supply of air from it. Reducing the sewers of the city to the dimensions of three feet by four, they would form a tunnel only two hundred and sixty miles long ; therefore the consumption of one thousand tons of coal in twenty-four hours would empty the sewers twice in that length of time. This would perfectly destroy the malaria in the sewers and prevent it finding its way into the upper air. This scheme may be called impracticable, yet it is not so in reality. The gases of the sewers are nearly or quite all combustible, and the air being rapidly renewed, would not have time to become foul. The amount of incombustible gases in the sewers at present without ventilation is so small as to be practically nothing. As malaria is heavier than the air generated on the surface and in the gutters of the streets, it would naturally flow into the sewers, and so be burned up by the fires. In private houses it would be well to have the ranges, furnaces and stoves connected with the cellars, so that they might take their air from the lowest point in the house, while from the cellars tubes should be extended to take air from the top of the house.

DR. BRADLEY said he was better pleased with this plan than any that he had ever seen presented for the same object. He had reflected carefully upon every word that had been said, and could see no objection. Upon the theory of malaria, however, he materially differed from the preceding speaker, deeming the so-called malaria a condition of the air ; but fire would destroy that condition, by making the air dry and more ready to take up the perspirable matter from the system.

DR. RICHARDS said he thought this as important a subject as had been brought before the Institute.

The PRESIDENT said that it had been proposed to stop the building of factories within the city, on account of the amount of carbonic acid generated by them ; but if the plan spoken of by Professor DARBY were adopted, it would be perfectly proper to allow them to go on, providing they would draw the air for their furnaces from the sewers.

MR. WIARD asked if the air from the sewers would support combustion.

DR. D. D. PARMELEE got very excited over the subject, and made remarks as follows : MR. WIARD has said the great question of the day is how to economize fuel. We have the various thousand contrivances to do this, and this subject is exciting the whole scientific world. Hence we have large factories for manufacturing oxygen gas. Now, this sulphuretted hydrogen which fills our sewers is deleterious to the manufacture of iron and retards combustion ; and do you suppose you can compel me, after I have invested my hundred thousand dollars, or, if you please, fifty thousand dollars, for a small concern—now, I say, can you compel me to draw my air out of your sewers? No, sir ; the air is a product that laws cannot command. The whole theory is impracticable and wrong.

As by the proposed plan the sewers would be emptied of air rather oftener than twice in twenty-four hours, it must at once be seen that the accumulation of gases injurious to combustion or the qualities of iron would be nearly impossible, and it is reasonable to suppose that the air of the sewers would then be as pure, at least, as that of some sections of the city in the vicinity of large manufactories is at the present time. The sewers of Paris have an atmosphere quite equal to that above. —REPORTER.]

MR. NORMAN WIARD then read a paper upon "The Ship of the Future," which we publish entire in another column.

In the discussion which followed, Dr. RICHARDS asked whether a preparation of gutta-percha had not been used for protecting the bottoms of iron ships from fouling.

MR. WIARD said there had been many experiments with this object in view, but he did not know whether any were successful in accomplishing the result. Corrosion is the worst enemy.

DR. BRADLEY wanted to know how zinc slabs connected with the iron slabs, so as to form a galvanic connection, would work in preventing this corrosion.

MR. WIARD detailed his experience with galvanized and coppered rivets, which showed pretty conclusively that the iron was corroded more rapidly in the presence of the other metal than when alone.

DR. BRADLEY still thought that the zinc would be the corroded metal, and the iron would be protected by the galvanic agency.

The PRESIDENT remarked that MR. WIARD had produced an entirely new point in the destruction of iron ships by unequal expansion.

MR. ROOSEVELT said wood expands less than iron in one direction, and none at all in the other, under the effects of either heat or moisture.

MR. WIARD then made some remarks on paint for preserving, and detailed an experiment in the gain in weight of painted and unpainted wood in water. The sticks were pine, and were first, unpainted ; second, painted with good paint ; and the third covered with gutta-percha paint. The respective gain in weight was two ounces, one ounce, and nothing. It was proposed at Fortress Monroe to paint iron plates with benzine and gutta-percha mixed, to preserve them, but this did not answer.

MR. AMOS BROADENAX then presented a drawing of an improved baker's oven. One of its chief features was the introduction of a current of mixed steam and air, and the removing of the gases arising from the bread.

MR. FISHER said he did not think there was a safe ship afloat, and made some remarks, showing the immense loss of life at sea, caused by the faults of ship-building.

Emigration of Welsh Miners and Iron Workers.

THE tide of emigration from the Welsh Hills and other parts of the district flows on more rapidly as the season advances, and large numbers of iron workers and miners, with their wives and families, are continually leaving the district to try their fortune on the other side of the Atlantic ; but the majority generally make it convenient to go in batches, and that also on the "pay Monday." Last week about two hundred from the Hills passed through the Pontypool station for Liverpool ; from forty to fifty left the neighborhood of Ebbw Vale for America ; about forty from Maestag ; and sixty-seven left Aberschyan on Tuesday for the same country. Should this state of things continue for any lengthened period, it is pretty evident that masters will experience some difficulty in procuring a sufficient number of hands, and more especially those tolerably well skilled in the manufacture of iron, that particular class being among the first to quit the homes and scenes of their childhood.—*London Engineering.*

THE question of the coal supply moves a great number of large intellects. In England they have decided that coal will never be cheaper, but that the supply will hardly effect values during this generation. Deeper working will ultimately, however, render coal more expensive there. The coal fields of this country occupy about 200,000,000 square miles. These contain, it is estimated, 3,500,000,000 tons of coal. Lowell daily operates 10,000 horse-power by the aid of coal. Suppose two and a half trillions has to be reserved for fuel, the remaining trillion tons would furnish power for 1,000 Lowells for more than 10,000 years.

At Carondelet, Mo., a mill is to be erected which shall be able to manufacture from 35,000 to 40,000 tons of iron and steel rails annually. Work upon it is to be commenced soon, and no expense will be spared to make it one of the finest iron mills in the country. The present Kingsland Iron Company, with a few associates, are the prime movers in the enterprise. Thus the wisdom of a protective policy is being demonstrated by the springing up of important manufactures, even in those sections of the country whence have come the loudest clamors for Free Trade.

AT the Lake Superior copper mines, last year, 30,909,549 pounds of mineral were smelted. They yielded 23,483,079 pounds of fine copper. These mines are not exhausted, nor do they as yet show any signs of giving out.

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st.	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col.	P. P. Fullerton, 71 B'way.	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada.					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00		10
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad.	2,500,000	100 00	28	
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau.	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					18	21
Consolidated Gregory	Colorado				1 50	1 60
Combination Silver	Nevada			100 00		
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5,000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col.	J. P. Davies, 19 Cliff	306,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William.	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Beet, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E.	H. Adams, 71 Broadway	2,000,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way.	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall.	400,000			
Grass Valley					21	24
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col.	P. P. Fullerton, 71 B'way.	1,000,000		9	12
Lander Hill T. & S	Nevada	M.L.Catherwood,74 B'way.	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold					01	02
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall	12,000,000		7	8
Mariposa preferred	California	do. do.			15½	16¾
Montana Gold		G. De Cordova	400,000			
Montana M. L. & M. Co.	Montana	A. M. Hoyt, 22 William	250,000			
Montrose	Clear Creek Co., Col.	W. W. Perkins, 71 B'way	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall	2,000,000			
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau.	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way	2,000,000			
N. Y. & Utah P. & M.		W. H. Mailler, 108 Wall				
Nye						
Ophir Gold	Comstock Lode, Nev.	L. C. Warner, 70 B'way	625,000			
Owyhee Gold		W. H. Smith, 43 Ex. Place.	1,700,000			
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		20	
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000			
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00		
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewill, 19 Broad	1,000,000		1 00	
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M.	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad	2,500,000	20 00	1 00	1 10
Social & Steptoe Con.		T. H. O'Connor, 24 Nassau.	450,000			
Standard Gold		C. B. Bostwick, 169 B'way.	500,000			
Symonds Forks						75
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau.	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way.	300,000			
Wamba Yuma	Arizona	J. W. Silsby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co.		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		E. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way	1,000,000			
Cumberland C. & I. Co		E. Kisean, 90 B'way	5,000,000			45
Derby Coal Co		W. S. Davison, 11 Broad				
Dover Coal and Iron Co		L. Chase, 88 Wall				
Del. & Hudson Canal Co		R. H. Nodyne, 7 Nassau	15,000,000	100 00	100	
Ebervale Coal		G.L.Stout, Treas. 111 Br'y.	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way	300,000			
Kemble Coal & I. Co		R. A. Wight, 26 Ex. Place	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C	Pennsylvania	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa.			1 00	
Mahanoy			400,000	100 00		
McNeal C. & I. Co		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co		G. Wrighton, 34 Wall				
Peckskill Iron Co		W. Murdock, 7 Nassau				
Pennsylvania Coal Co		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co		C. H. Smith, 165 B'way	1,000,000			
Scotia Coal Co		C. S. Soper, 42 B'way	2,500,000			
Spring Mt. Coal		J. Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C.		E. D. Webb, 77 Cedar	600,000			
Stout Coal Co		G. S. Comstock, 111 B'way	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		I. T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y.	3,400,000			
Wyoming Val. Coal Co		E. Potter, 40 B'way	1,000,000			

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper						
Eagle Harbor Copper	Michigan.	W. H. Smith, 43 Ex. Place.	500,000	25 00		
Evergreen Bluff Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000	25 00		
Globe Copper		R. K. Rickard, 19 Nassau	200,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine	500,000			
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place.	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co		J. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place	1,000,000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place.	500,000			
Lake Superi'r Silver Lead	Michigan	A. S. Kellogg, 22 Pine	1,000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 45 Ex. P	500,000			
Rockland Copper	Michigan	A. Fullerton, 71 B'way	500,000			
St. Joseph Lead	Michigan	A. W. Jones, 6 Broad st,	1,000,000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	500,000			
Vermont Copper	Vermont	J. C. Ely, 191 B'way	500,000			
Wallkill Lead, asst		S. M. Pond, 70 B'way				

MISCELLANEOUS.	SITUATION MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co.		H. Bogardus, 14 Pine				
Quicksilver						
Covill B. L. M. & M'f. Co		C. R. Bostwick, 302 Pearl	250,000			
Manhattan Marble		H. K. Gates, 70 B'way	500,000			
N. Jersey Zinc Co	New Jersey	A. H. Farlin, 61 Maiden L'e.	1,500,000			

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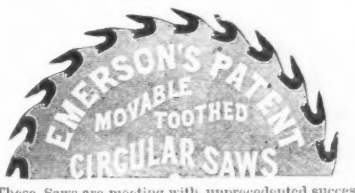

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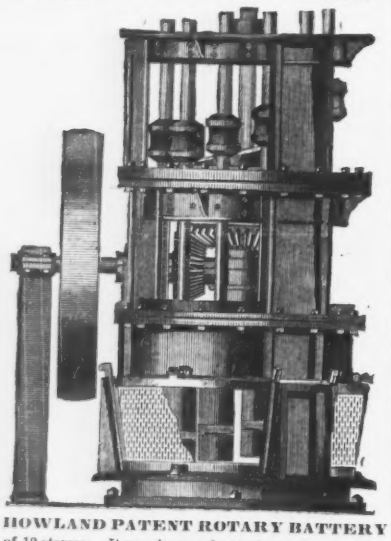

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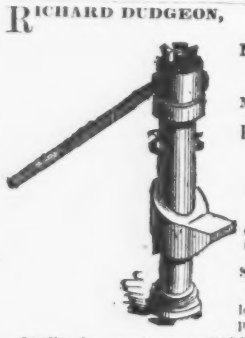

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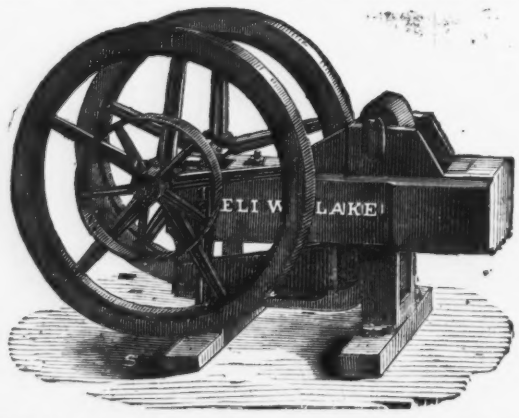

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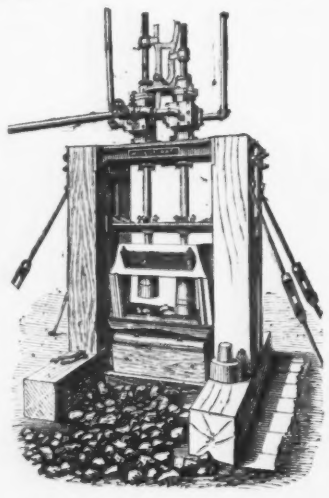

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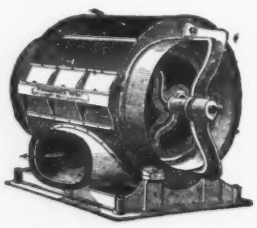

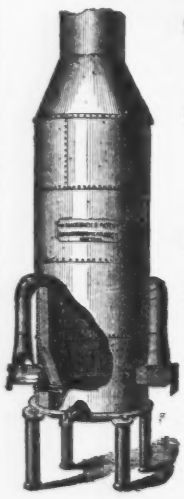

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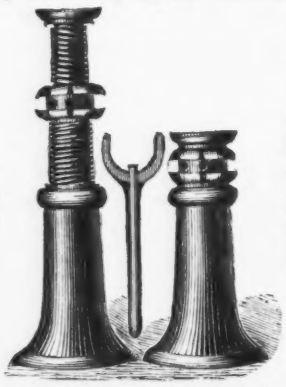

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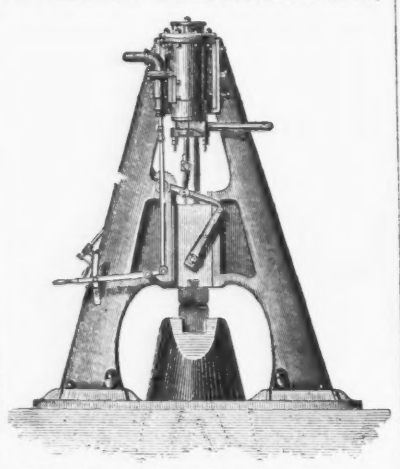

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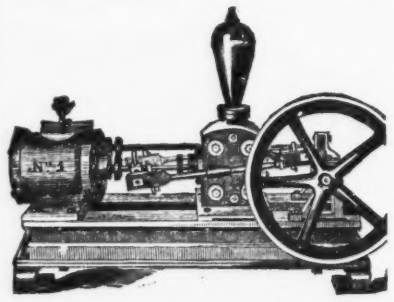

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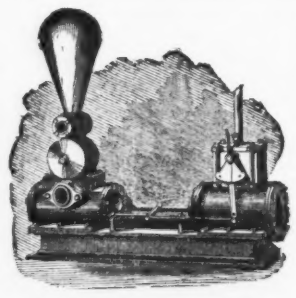

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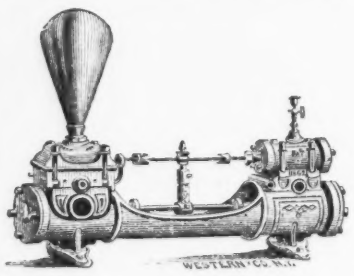

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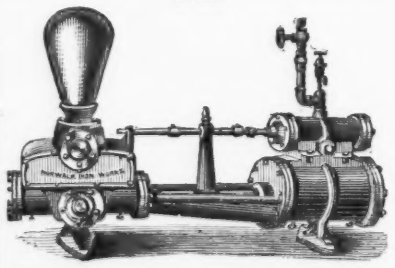

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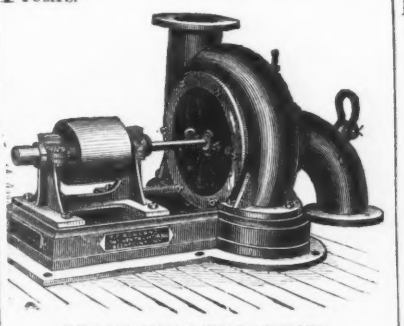

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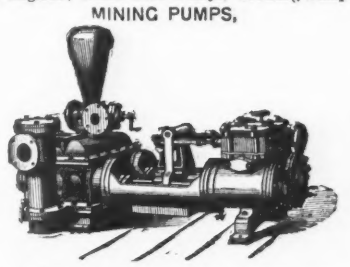

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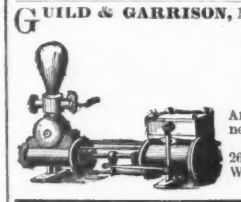

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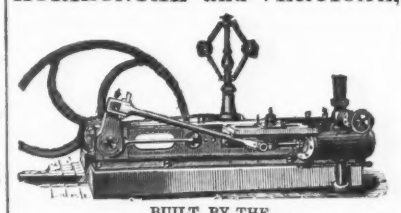

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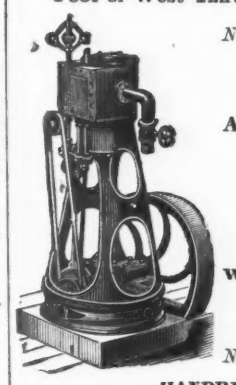

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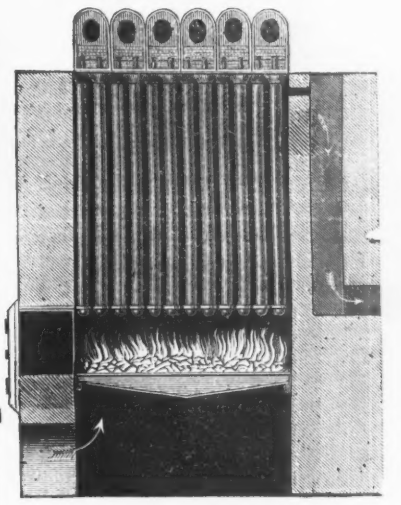

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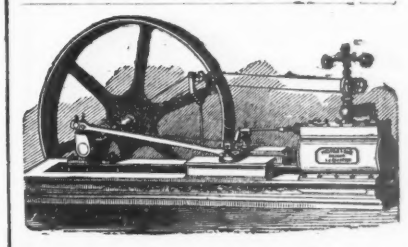

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Air, why it is propelled down, into and around the workings
" Quantity of, produced by the furnace.
" Friction of
" The great friction of produced by one mode of ventilation, and how reduced by another
" Pure added to impure (plans.
" Splitting of (plans)
" One current of (plans)
" One current of, and how to adopt separate currents (plan)
" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
" Weight of in shafts
" How to find the weight of
" Table of pressure in shafts
" Expansion of
" Its velocity and force
" Rush of, into each division
" Quantity produced by natural ventilation
" Splitting, why it should be adopted
" Splitting, why the workmen object to Mr. Hopton adopting the mode
Anemometer, measurement of air by, engraving of
Area of a pit, how to find
Barometers, Showing the time of an outlet of gas in mines (engraving)
Bricks, how to find the number in the walling of a shaft.
Buddle's plan
Circumference of a pit, how to find
Coal, several ways of working it out, and why man methods of working it out are adopted
" Working out in banks (plans)
" Working it out in following up banks (plan)
" Working out in pillars (plans)
" Working out in long wall (plans)
" Working out in drifts (plans)
" Working out with no regularity (plan)
" Working out by the "end way" or in endings (plan)
Cubical Contents of a pit, how to find
Dialing, the mode of
Dials, several engravings
" How constructed
" How fixed in mine surveying
" Needle, its variations
Diameter of shaft
Dip of mine, how to find and lay on (plan)
Explosion, the power of an
" At Lund-hill, in what part of the mine it was supposed to take place (plan)
" How the power may be diminished
Furnace, how to find the horse-power of
" The place of fixing, to produce the largest ventilating current
" Engravings of ground floor, front and back view
" Remarks upon
Gases, (carbonic acid) composition of
" Do. properties of
" (After, or choke damp) composition of
" (Carburetted hydrogen) do.
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines generate a mixture of
Goaf, or gob, how tramrods are made through (plan
Lund-hill (plan)
Managers, who are best competent to manage mines
Miscellaneous questions
Natural ventilation
Planning, how workings are laid on the plan
Regulations (see R on plans)
Safety Lamps, why flame will not penetrate through, engraving of
Sections on mechanical ventilation
Summary of accidents
Surveying, how mines are with the dial
Surveying, how mines are with the theodolite
Tables of weights and measures
Temperature on surface
Temperature in mines
Temperature, difference of between down and up-cast
Theodolites for mine surveying
Theodolites, how constructed
Theodolites, the magnetic needle dispensed with, and how workings are laid on plan, with Theodolite surveying
Theodolites, how mines are surveyed with them
Up-cast larger than down-cast (plan)
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IV.—Giant powder and common powder.

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VIII.—Nye County.
IX.—Lincoln County.
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XI.—Humboldt County.

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Chapter XII.—General geological features.
XIII.—Population, property, railroad, etc.
XIV.—Placer mines.
XV.—Quartz mines.
XVI.—Operations of the United States law.

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Chapter XVII.—Report of Mr. Ashburner
XVIII.—The War Eagle tunnel.
XIX.—Bullion product.

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Chapter XX.—Arizona.
XXI.—Utah.
XXII.—The Isthmus of Panama.

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Introduction.

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Chapter XXIII.—Mining and mining law among the ancients.
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XXVIII.—Mining law of Switzerland.
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XXXI.—Mining laws of Canada.
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Chapter XXXIII.—Means of disseminating information with regard to mining and metallurgy; the National School of mines.

SECTION VII.—*Mining Education—Continued.*
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[ILLUSTRATED ARTICLES ARE MARKED WITH AN ASTERISK.]

JANUARY.

*Gold and Stock Telegraphy, ... 1
Persian Arms, Damask Steel, and Damaskeening, ... 2
How to cause a Tempest in a Teapot, ... 2
The Causes of the Difference in the Color of Bricks, ... 3
How to make different Cements, ... 3
Learned Blacksmiths, ... 3
*Dove-Tail Joints, ... 4
Wall-damp, ... 5
The Utilization of Tin Scraps, ... 6
The Firmness of Paper, ... 6
New City Buildings, ... 7
*Have you ever looked through a Microscope? 8
The Mechanic and his Work, ... 8
Reversible Seats, ... 9
Preventive of the Decay of Wood, ... 9
Colorado Manufactures, ... 9
Chemical Engineering, ... 10
The New Art of Fresco-Painting, 10
"Old Says" on Building, ... 11
The Progress of Building, ... 11
Chrome-Yellow Paint, ... 11
*Hints for Sign-Painters, ... 12
Imitation-Marble, ... 13
Common Mortar, ... 13
New Paint for Floors, ... 13
Apatite; Its Importance in Domestic Economy, ... 14
Gun-Cotton, ... 14
The Preservation of Wood by Immersion, ... 14
Ventilation and Heating by Currents, ... 15
Cement and Mortar of the Ancients, ... 15
Bridging the Missouri, ... 16
*The Park Bank Building—A Palace of Finance, ... 17
The Air in Lecture and School-Rooms, ... 18
Prize Problems, ... 19
Glass, ... 19
*Improvement in Saws, ... 20
Hoosac Tunnel, ... 21
*Deep-Sea Cables, ... 22
An Important Invention, ... 22
To the Public, ... 22
Trades' Unions in the United States, ... 23
Literary, ... 23
Mechanics' Homes, ... 24
*Long Island Villa, with Mansard Roof, ... 24
*Villa Cornice Work, ... 25
Children's Toys, ... 25
To the Press, ... 26
Occupations and Wages in California, ... 26
Queries, ... 27
Special Notice to Travellers, ... 27
Advertisements, ... 27

FEBRUARY.

*Portable Wainscoting, ... 33
Ventilation and Warming, ... 34
A Few Words about Bricks, ... 35
*The Bessemer Process and its Late Improvements, ... 35
Wire-Rope, ... 37
Hollow Walls, ... 39
Rock-Drilling Machine, ... 39
Mr. Mudge on Woolen Manufactures, ... 39
*Water-Proofing Dress Goods, ... 40
Insoluble Cements, ... 40
Atmospheric Action on Building-Stones, ... 40
*Anatomy of the Screw, ... 41
Lead Pencils, ... 41
Artificial Light and the Subject of Ventilation, ... 42
Architecture and Civilization, ... 43
Arches—Old and New, ... 43
Manufacture of Sheet Tin, ... 44
Rates of Travel, ... 44
Hand-Power Machine, ... 45
The History of Windows, ... 45
To Restore Burnt Cast-Steel, ... 45
To Bleach Palm-Oil, ... 45
The Building-Stone and Slate of Virginia, ... 46
The New-York Milling Interest, ... 47
* The New-City Post-Office, ... 48
Review of City Buildings, ... 50
Decay of Wood and Processes for Preserving it, ... 51
The Daguerrean Process, ... 51
To obtain Different Shades of Chrome-Yellow, ... 52
*Improved Cupola and Blower, ... 52
Literary, ... 54
Real Estate for Workingmen, ... 55
The Philosophy of Building, ... 55
*Villa and Cottage Architecture, ... 56
Consumption of Milk, ... 57
Trades and Professions, ... 58
Bread-Making, ... 58
Castle-Garden, ... 58
Queries, ... 59
Special Notice to Travellers, ... 59
Advertisements, ... 59

MARCH.

*Brick-Making, ... 65
Absorbent Capacity of Bricks, ... 66
Lake Colors—Their Nature and Manufacture, ... 67
*Steam-Dredging and the Suez Canal, ... 68
The Selection of Wall-Paper, ... 71
*Marble Paper Manufacture, ... 71
Sand-Grinding Machine, ... 73
*The Gothic Furnace, ... 74
Ventilation and Heating by Currents, ... 74
*The Ventilation and Warming of School-Houses, ... 75
*Iron Buildings, ... 76
Hints on Economic Building, ... 78
Copper and its Alloys, ... 79
Cryolite—Where found, Nature, and Uses, ... 80
Chrome-Orange, ... 80
*Illinois State Capitol Design, ... 80
The Uses of Gun-Cotton, ... 82
Terra Cotta, ... 82
Building-Stones—Their Preservation, ... 82

APRIL.

*Improvement in Hand-Drills, ... 97
Renovating Silk Hats, ... 97
Memoranda concerning Nails, ... 98
Comparative Weight of Pattern and Castings, ... 98
Flint-Glass, ... 98
Wolfram or Tungsten Steel, ... 99
Cheap Brick Walls, ... 99
*Stereotyping, ... 99
Edge-Tools, ... 102
Road-Dust and Vegetation, ... 102
Aniline Colors, ... 102
Soap-Making in the Olden Time, 103
*Manufacture of Vinegar, ... 104
Textile Fabrics from Glass, ... 104
The Effect of Artificial Light upon the Eyes, ... 105
*The Daguerrean Process, ... 105
Building in California, ... 105
The Piano-Forte, ... 106
The Art of Gilding, ... 106
Ventilation and Warming, ... 107
*Ventilation and Warming of School-Houses, ... 108
*The New-York Fire-Place Heater, ... 109
Cheap Houses—Building on Piles, ... 110
*The Vermont Slate Industry, ... 83
Literary, ... 86
"Too Many Irons in the Fire," .. 87
The Tinning and Silvering of Looking-Glasses, ... 87
*French Sash-Windows, ... 88
*Whence Came our Silks? 88
*Cottage and Villa Architecture, 89
What Shall Workingmen Read? .90
The Dwarf Builders, ... 90
Nature as a Builder, ... 91
Sharpening Files by Corrosion, .. 92
Queries, ... 92
Special Notices, ... 92
Advertisements, ... 92
Economic Furniture, ... 111
The Manufacture of Cases for Percussion-Caps, ... 111
*The Thames Embankment, ... 112
*Automatic Indicator for Water and Steam, ... 115
*Winds and Chimney Draughts, 115
*Improved Electric Fuse, ... 116
*Stone-Breaking and Ore-Crushing, ... 117
Literary, ... 118
Are Men Equal? 119
Beauty in the Household, ... 119
Coöperation, ... 120
Irish Moss, ... 121
*Cottage and Villa Architecture, .. 121
Public Baths, ... 121
Manufacture of Brushes, ... 122
A Large Building, ... 122
To Clean Glass, ... 122
How to Make the Peasley Cement, ... 122
Polytechnic Association of the American Institute, ... 122
Manufacturer and Builder at $1.50 per year—How it is Done, 122
Large Cash Premiums, ... 123
Queries, ... 123

MAY.

*The Telephone, ... 129
Peroxide of Hydrogen for the the Hair, ... 130
The Daguerrean Process, ... 130
Glue, ... 130
How to put a Cross-cut Saw in Order, ... 131
Coraline Dye—Injurious Effects Therefrom, ... 131
Mixing Things Up, ... 131
*On Boiler Explosions, ... 132
How to Repair Chain Pumps, ... 134
New Element, ... 134
*Béton Building, ... 135
Hydraulic Mortar, ... 135
Shellac for Water-Proof Coatings, Dyes, Paints, and Printing Inks, ... 136
*Improvement in Billiard Tables, ... 137
Historical Notes on Paper Manufacture, ... 137
Kalsomining Walls, ... 138
A Plea for Stone, ... 138
On Forging, Hardening, and Tempering Mill-Picks, ... 139
Chrome-Yellow Paint Practically Tested, ... 138
*Water-Closets, ... 140
Welding Copper, ... 140
The Largest Suspension Bridge, 140
*Improved Hoisting Apparatus, .141
Colored Marbles, ... 141
The Piano-Forte, ... 142
Thames Embankment—South Side, ... 142
Seaweed Charcoal, ... 142
Ventilation and Warming, ... 143
The New Metal Hydrogenium, .. 144
Painting Zinc, ... 144
Artificial Alizarine for Coloring, .144
Priscian a little Scratched, ... 144
Suez Canal, ... 144
*The New State Emigrant Hospital, Ward's Island, ... 145
Magenta, ... 145
Varnishes for Iron, ... 147
Ornamental Glass—Opaline and Enamel, ... 147
Ship-Building—Here and in England, ... 147

JUNE.

*Improved Steam Pump, ... 161
What Paint shall we use? 162
Varnishes—their Nature and Manufacture, ... 162
Something of practical Importance in the Use of Plaster-of-Paris, ... 163
Influence of Water in the Manufacture of Wax-Leather, ... 163
Why do we Oil our Whetstones? .163
Compressed Leather, ... 163
*The Art of Electrotyping, ... 164
Practical Hints on Working and Tempering Steel, ... 166
Spiritual Photographs, ... 167
"Too Much Pork for a Shilling," 167
Credit to whom Credit, etc., ... 167
Store-Shutters, ... 168
Damp Cellars, ... 168
The Velocipede as a Mechanical Agent, ... 168
Calculating Areas by Weight, ... 168
Aniline Gray, ... 168
The Generation of Oxygen Gas from Sulphuric Acid, ... 168
*On Testing Iron by Magnetism, 169
Blowing a Wine-Glass, ... 169
How Jewelry is Made, ... 170
American Wheels, ... 170
Ventilation and Warming, ... 171
The Manufacture of Pins, ... 171
Right-Handand Left-Hand Locks 171
Lisieux and its Linen Factories, 171
Cleaning Gilded Ware, ... 171
Encaustic Tiles, ... 172
*Salt—its Manufacture and Uses, 172
Paper Belting, ... 173
Vegetable Oils—their Production and Purification, ... 174
Chimneys and Chimney-Shafts, .174
Industrial Progress, ... 147
A New Ornamental Wood, ... 149
Sprinkling Streets with Deliquescent Salts, ... 148
*Old and New Fire-Grates, ... 148
Effect of Cold upon Tin, ... 148
Cryolite as a Source of Soda, ... 149
Literary, ... 150
Credit, ... 151
On Going Surety, ... 151
Interior Decorations, ... 151
*Church Architecture, ... 152
*Ornamental Work—Ceiling and Railing, ... 153
Purifying Water, ... 154
Adulterations, ... 154
New Cements, ... 154
Welding Steel to Iron, ... 154
Queries, ... 155
New Advertisements, etc., ... 156
Artificial Stone, ... 175
Plank Walls for Cottages, ... 175
New Fact in the Behavior of Iron, ... 175
Science and Art, ... 175
*The Kansas City Bridge, ... 176
Cement to resist Red Heat and Boiling Water, ... 178
Recovery of Fatty Matter from Waste Soap-Waters, ... 179
Paper Houses, ... 179
Sodium as a Substitute for Phosphorus in Lucifer Matches, ... 180
A Plea for Iron, ... 180
To Keep Nails from Rusting, ... 180
*Wrought-Iron Arch Girder Bridge, ... 181
Liquid Fuel, ... 181
New Mode of Breaking Masses of Iron, ... 181
Utilization of Street Dust, ... 181
Literary, ... 182
How to Spoil a Husband, ... 183
Chess, ... 183
A New Alloy, ... 184
*A Country or Suburban Barn, .. 184
A New Material for Bonnets, ... 185
*Design for a Summer House, .. 185
Workingmen as Students, ... 185
Eating, ... 185
The Philosophy of a Candle, ... 186
Adulterations, ... 187
Recipes for Earthern-Ware Glazing, ... 187
Hemp, ... 187
A Poor Prospect for the Year 1900, ... 187
Setting Fence-Posts, ... 187
Queries, ... 187
New Advertisements, ... 188

The above speaks for itself. In a period of six months we gave upwards of **500 COLUMNS OF MATTER,** from the pens of the best writers in the country and presented in connection therewith upwards of **150 ENGRAVINGS!** The second half volume is equal to the first half in every respect, and it is our determination, during **1870,** to even surpass all our former efforts and make the MANUFACTURER AND BUILDER **INDISPENSABLE** to every

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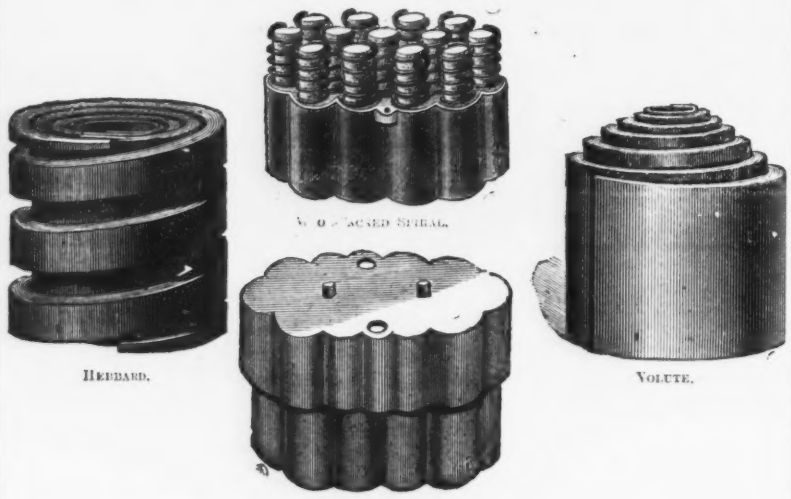

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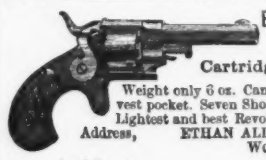

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THE ENGINEERING AND MINING JOURNAL.

VOL. IX.—NO. 24.—THIRD SERIES.] NEW YORK, TUESDAY, JUNE 14, 1870. [SINGLE COPIES 10 CENTS.

Traction and Tramway Engines.

THE illustrations accompanying this article are perspective views of Road and Agricultural Locomotives and Tramway Engines, as manufactured by AVELING & PORTER, of England, and who have been awarded for them the first prize medals at the International Exhibition, London, 1862; Hamburg, 1863; Odense, Denmark, 1863; Königsberg, Prussia, 1863; and the Universal Exhibition, Paris, 1867.

The importance and advantages of self-propelling engines over the ordinary "portable engines," which have to be conveyed from place to place by horse power, or otherwise dragged heavily along by a vast expenditure of manual labor and money, are admitted facts; and not only are these Traction Engines employed for agricultural purposes, but they can be seen in successful operation in England, and many other parts of the world, in the timber yard, at the coal field, the copper mine, and the stone quarry, where they are doing the work of horses at far less than half the cost.

AVELING & PORTER'S Patent Road Locomotive Engine (see FIG. 1,) is arranged with double gearing, to travel at two speeds, namely, two and a half miles and five miles an hour. The working parts are housed in from the influence of dust and weather. This engine has one cylinder placed in the forward part of the boiler, and surrounded by a steam-jacket, at the top of which is placed the throttle-valve. Priming in ascending steep inclines is thereby prevented, and the use of steam pipes either inside or outside the boiler is avoided. Engines with single cylinders and reversing gear, when connected to the driving axle by means of AVELING'S patent chain-gear, have proved themselves more efficient, more powerful, less complicated, and in many respects better adapted for general traction purposes than engines with double cylinders. The driving-wheels are six feet six inches in diameter and eighteen inches wide, and have spaces in the face of the wheel, in order to fix on angle-iron paddles when passing over soft ground. Small castings slide into these spaces when the angle-irons are not in use. Either of the driving-wheels can be rotated at pleasure, which is a great advantage in turning sharp curves. The tanks carry water and fuel for a run of six to ten miles, according to the speed. A powerful friction-brake is connected with the driving-axle, and the patent arrangement for steering the engine is perfect in its action.

An elaborate series of experiments have been made lately with one of AVELING & PORTER'S road traction engines, "La Ville de Senlis," at Beaurain, France. The experiments were conducted by M. TRESCA Engineer, Sub-Director of the Conservatoire Impériale des Arts-et-Métiers, Paris, and approved by the Director-General Morin. The experiments were made in concert with Professor FLEEMING JENKIN, F.R.S., London, whose presence gives to the results arrived at a character of security that increases their importance.

The report of these gentlemen, which is a very lengthy and carefully compiled paper, concludes as follows:

"To sum up: The engine (La Ville de Senlis) drew in a regular manner, upon a good road slightly undulating, a total load of 60,000 kilogrammes (59 tons). The co-efficient of traction may be approximately estimated at 1-40, which would bring the mean strain to nearly 2,000 kilogrammes (39½ cwt.), taking into account the weight of the locomotive.

"This mean effort, developed at a speed of 1.08m. (3.64 feet) per second, brings the valuation of effective work to 2,160 kilogrammètres (15623 foot-pounds) per second, or to 28 chevaux vapeur (27.61 horse-power). This figure will appear high if it be compared with the consumption of fuel, which was 184 kilogrammes, (3c. 2q. 13lbs.), in three hours and three minutes, say 60 kilogrammes, (132.15 lbs.) per hour of actual travelling. This consumption represents only 2 kilogrammes (4.40 lbs.) of coal per horse-power and per hour.

"The corresponding consumption of water is not less than 600.46 litres (132.22 gallons) per hour of actual travelling. With the present tenders, which can hold 1,800 litres (396 gallons) of water, it is necessary to replenish them every 10 or 12 kilomètres (6¼ to 7½ miles). The co-efficient of adherence may be estimated on the road gone over at 0.2 of the adherent weight. The adherence resulting therefrom was only necessary for the working of the engine up inclines of 0.030 (1 in 33 to 1 in 30) and at starting.

"The load of 81,253 kilogrammes (79 19-20 tons) which the engine drew on level ground, is not the limit of what it can draw under these conditions.

"The speed of 4 kilomètres (2-48 miles) per hour appears suitable for traffic of this nature, and renders the manœuvres so easy that the train is well managed by a superintendent, an engine driver, and an assistant solely employed to guide the steering-wheel in front.

"Done by the Engineer Sub-Director of the Conservatoire des Arts-et-Métiers. H. TRESCA.

"Approved—The Director, GENERAL MORIN.

"PARIS, 15th January, 1868."

It is upon the principles adopted in the manufacture of AVELING'S road traction engine that the agricultural locomotive has been designed.

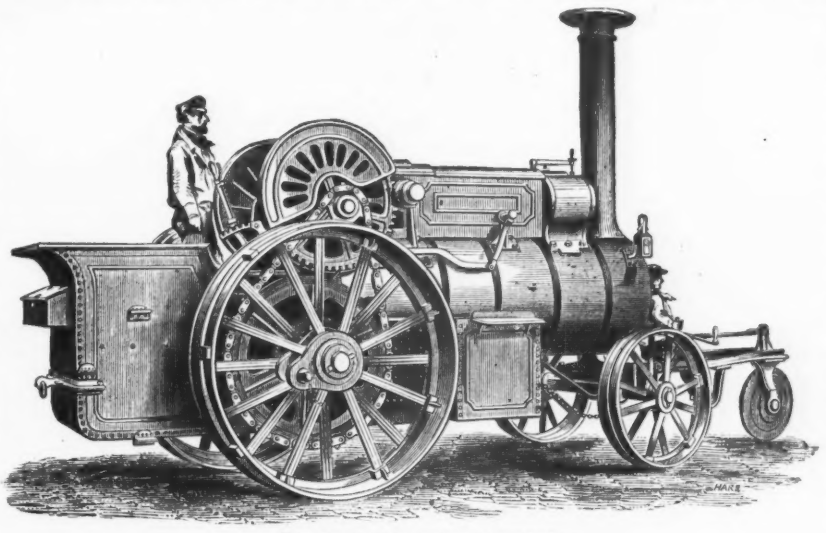


Fig. 1.—ROAD LOCOMOTIVE.

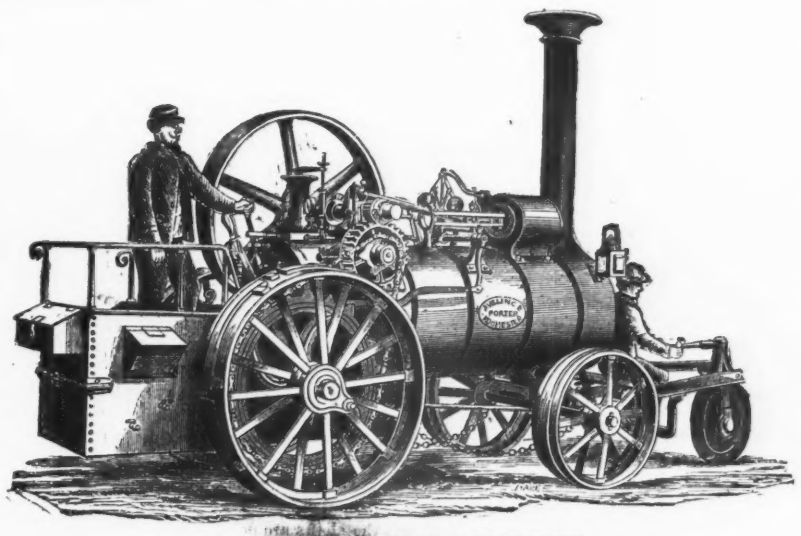


Fig. 2.—AGRICULTURAL LOCOMOTIVE.

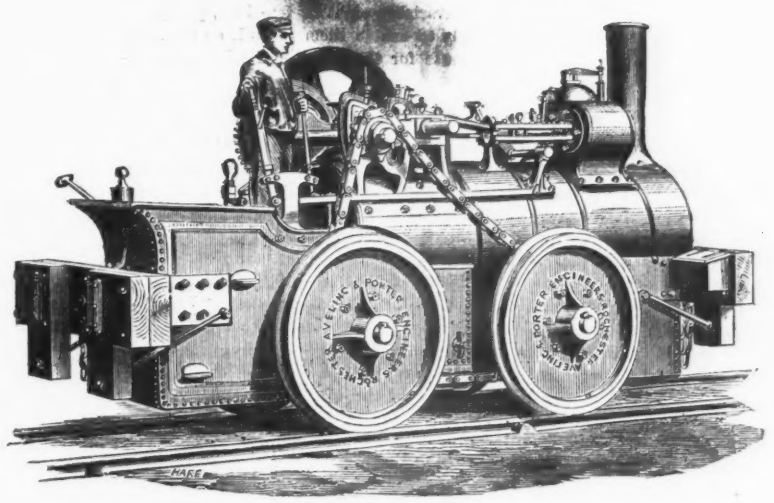


Fig. 3.—TRAMWAY ENGINE.

The illustration (see FIG. 2) gives a view of the agricultural locomotive, which is especially adapted for steam cultivation, thrashing, sowing, pumping, and removing agricultural products. The boiler is unusually large; it is clothed entirely with hair-felt, lagged, and covered over with sheet-iron, and proved to a pressure of 200 pounds to the square inch. Want of heating surface, and the use of steam pipes inside the boiler, causing loss from leakage and waste in heating, exhaust steam on its passage to the atmosphere, are serious faults common in agricultural engines. In this engine the cylinder is placed in the forward part of the boiler, surrounded by a steam-jacket, and with arrangements otherwise similar to AVELING'S road locomotive. The engine is capable of taking a load of from ten to fifteen tons over ordinary roads. There are upwards of four hundred of these engines in use in England and other countries of the European continent, and the testimony of the best and most competent judges, affirms the superiority and economy of the agricultural locomotive over all descriptions of engines used for farm purposes. The simple "portable engine," without any means of propelling itself, is but a small "half-measure" towards economy, and the difference in the cost of a locomotive and an engine which necessitates the expediture of much time and money for its removal, is so trifling when compared with the advantages gained by the newer methods, that there is little doubt of the ultimate adoption in this country of a plan that has proved so entirely successful abroad. The prize medal of the International Exhibition, London, 1862, and the Universal Exhibition, Paris, 1867, were awarded this engine. One of these engines is now being shipped to New Orleans, for use in farming operations in Arizona.

The illustration (see FIG. 3) exhibits a locomotive so constructed as to be worked upon an ordinary tramway, and may be described as a traction engine placed upon railway wheels, these wheels being coupled by the pitch-chain, which is employed to communicate the motion to them. These engines are made from four to thirty horse-power. From the crank-shaft the motion is communicated by spur gearing to a counter-shaft, carrying at its end the wheel for the pitch-chain, the bearing of this shaft being placed in curved slots formed in the supporting brackets, so that the shaft can be raised and the chain tightened when necessary. The crank-shaft carries a fly-wheel, and the engine is fitted with AVELING'S usual link-motion reversing gear. The wheels are of cast-iron, and the total weight of the engine (a ten horse-power) is nine tons. These engines have the advantage of stationary and portable engines for pumping, sawing, and driving fixed machinery of all kinds; they are capable of taking heavy loads at the rate of six miles per hour at a cost of three farthings per ton per mile. They are in use in her Majesty's dock-yards at Chatham, Portsmouth, and Davenport, and in many mines, quarries, brick-fields, and other large works in England and other European countries.

In all parts of Great Britain are to be found these tramway engines; and horse-power, which was formerly employed for working in mines and quarries, has, in a great measure, been replaced by small locomotives, and the cost of traction (which is less than two cents per ton per mile) thereby materially reduced.

Altogther, these engines have given abundant proof of being well adapted for use in quarries and similar places, where heavy loads have to be moved at slow speed, and in such situations it appears that they will do the work at about half the cost incurred by the employment of horse-power.

Messrs. AVELING & PORTER'S agent in this country is Mr. W. C. OASTLER, No. 43 Exchange place, New York, of whom any information relative to these machines may be obtained.

The Location and Arrangement of Shafts.

A Lecture by Professor WARINGTON SMYTH of the Royal School of Mines, London.

Reported for the London Mining Journal.

THERE are no points connected with mining on which the judgment of the engineer requires a greater degree of exercise than that of placing the principal and auxiliary shafts, and the mode in which they should be sunk; but here, as in so many other things, there is a wide difference between a metallic mine and one for coal and ironstone. In the matter of coal, a great many considerations come into play which do not arise in metalliferous mines. The dip of the bed or beds is a matter which often occasions considerable varieties of working, and then, in deciding upon the depth to be first reached, a good deal depends upon the number of years for which the lease or the right of working is taken. Suppose we had to deal with a square tract, which is known to contain coal, it may be of primary importance to know how it lies. It is then usual, if no clue is obtainable from old pits or natural exposure of the rocks, to ascertain by boring across it what the dip and general directions of the beds are. To do this may require a whole series of borings, but two or three will probably suffice. This depends a good deal on the magnitude of the area, and the importance of the mineral to be worked. Supposing there be three parallel beds of coal of equal value—one at one hundred, another at two hundred, and a third at three hundred yards deep, and your lease is but for twenty-one years, it would be absurd to sink to the deepest bed: and as to the others, it would be a matter of calculation so to place the shafts as to take out as large an amount of coal as will be most consistent with the terms of the lease. If the length of the lease be greater, then deeper shafts would be sunk, and used with a view to a larger amount of get; but in selecting the site other considerations must also be taken into account. Thus, if there be a main line of railway near, or a canal, or a navigable river, or the sea shore, or any other advantage of transit, something which is not in itself unimportant may have to be postponed out of consideration to these more easy ways of loading the material for the market. Otherwise an entire series of engineering works may be needed for the purpose of bringing the material down to such a point of discharge at a very great cost. Thus, in the north of England there are many excellent coal properties which would not be paying concerns were it not that they have a good and cheap outlet for their produce in this way. Before, then, any engineer begins to open out his works upon a piece of mineral ground, he must determine what means of outlet he will have, for without that he cannot fix on the best place at which it is desirable to sink the shafts. He might have to pay a heavy royalty or mileage for a way over private lands; and the direction that way would be allowed to take so as to involve the least annual cost should have an influence also as to the position in which the shaft should be placed. Bargains are, however, most frequently made which enable the adventurers to work the whole of the estate on the payment, perhaps, of a simple royalty, and the course then pursued is to sink at the deepest place from which the whole may be conveniently worked, and to put down the deepest pit there and then, at a little distance, the raising shaft. It will next be a question whether these only should be trusted to, or whether there should be in addition a ventilating shaft, which is generally placed on the rise. These are circumstances which ought to be well looked to at the beginning of the work. A certain seam being known to exist, the question is one simply of economy, how best to get down to the seam, and how best to work it out so as to get a certain number of tons per annum. What makes the question of shafts so important is the cost—oftentimes enormous—of sinking, lining, and tubbing them. An ordinary shaft, in not unusual ground, and not more than fifty fathoms deep, may cost from £5,000 to £10,000; at greater depths, the cost is not unfrequently £40,000 or £50,000, and sometimes cases occur in which it is even more than that. Taking the requisite machinery also, there are two or three collieries in the North of England in which the shafts have not cost less than from £100,000 to £150,000; and in metalliferous mines, where the work to be cut through has been of unusual hardness, as, for instance, many forms of granite or killas, the cost of a moderately deep shaft will be from £15,000 to £20,000. It is, therefore, a most serious consideration, as if the shaft should be sunk in the wrong place, and the case should necessitate its being carried to so great a depth, it will be impossible to calculate the loss which may ensue. Indeed, the capital and courage of a company could hardly be expected to hold out against such enormous expenses in the face of uncertainty of success in the end.

Whether a shaft should be perpendicular, or more or less inclined—I am speaking of metalliferous mines—is a question to be decided not only by the circumstances of each case, but it is a good deal affected by the custom of a district. Thus in Hungary perpendicular shafts prevail, while in Cornwall inclined shafts are the more numerous. The Cornish system has grown out of the fact that the shaft itself is there exploratory in a majority of cases, and follows the vein itself from the outcrop, so that every fathom in that way is carefully examined. Sometimes there is but little choice in the matter, as, for instance, in the case of a well-known mine on the banks of the Tamar, where the valuable mineral deposits lie under the river. At the same time, when the dip and direction of a lode are known, and the appearances are good, it is better to sink a perpendicular shaft to the deeper part of the lode, from whence the mineral is raised to the surface by a shorter route than if the shaft were on the lode. In this latter case the sinking must either be on the hanging-wall side until the vein is intersected on the footwall side, and then by cross-cuts driven through dead ground the vein is reached, and no doubt in either case there will be considerable expenditure and loss of time before anything at all is seen of the lode, or obtained from it—an objection which often leads to the sinking being on the lode itself, as at every foot there is a chance of taking out something to pay expenses. It is surprising, however, that some miners, and particularly in Ireland, should so often prefer to sink on the footwall side of a lode, as it is obvious when the lode dips at any considerable angle, the deeper they go the further they will be from the lode, and the greater distance they will have to cross-cut to get at it; when by sinking on the hanging-wall side they would intersect it without a cross-cut. The reason they give is one which is only applicable where the productive levels are tolerably near the surface. Thus, in driving to intersect the lode, they would only have half the distance to go on the footwall side, as compared with that on the hanging-wall side. That advantage grows less the deeper the shaft descends, and it most frequently happens, that it is only from considerable depths that the best ores are obtained. There is also a further most important consideration, and that is the greater insecurity existing on the hanging-wall side where the lode runs in parallel strings, and where a great portion has to be removed, leaving large spaces in the ground, and creating dangers which tax the best energies of the mining engineer. A case of this sort in Cornwall, only a week or two ago, resulted in a lamentable catastrophe.

With respect to the form and dimensions of shafts, there is great variety. If we go into the stratified districts of England and Scotland we shall find them generally circular, and that for the purpose of presenting an equal resistance on all sides to the pressure of the measures, and, as we have seen, lined with brick or stone work when dry, and tubbing when wet. Circular shafts are not usually more than from seven to twelve feet in diameter; but there are some in Staffordshire through which large volumes of air have to be passed, as much as fifteen to twenty feet. Under these circumstances a strictly circular form is not the most convenient, and we often see shafts divided. When cutting a winze, or in beginning a shaft, it is necessary to divide the opening into two parts—one for a down current, and the other for an up current, so that the workmen at the bottom may have fresh air, and these divisions are called bratticing. In some parts of Wales colliery shafts are elliptical, twenty-two feet in length, and from twelve to sixteen feet across. They are then divided, and each division used for particular purposes.

In most of the foreign mining districts, in Pembrokeshire, and other parts of South Wales, and in some districts of Scotland, the rectangular form is preferred, even for collieries, and being divided, is thus set apart for different purposes, such as for ladder ways, pumping, and other machinery for raising the mineral. The dimensions of shafts vary a good deal, according to custom or local notions. In districts where mining is carried on without much capital, and by a few miners joining together, the shafts are miserably small. In Somersetshire there are old shafts to be seen like wells, and not much more room in them, so that it is almost impossible to deal with machinery in them, or to pass sufficient quantities of air through them. And so in other metalliferous districts they will be found no more than four feet square, with, perhaps, a lining to be taken off that. Little old shafts of this kind are found too, in districts where lead mines on a small scale are carried on by the men, having in them a ladder on one side, and a bucket, raised by a windlass, on the other. But where workings are carried forward on a proper scale, shafts are seldom less than four feet across, and six feet in length for the ordinary drawing purposes. If it is to serve for an engine-shaft and pumping-rods, and also for ladders, it must be not less than eleven feet in length, by five feet across in the clear—that is to say, within the timbering or stone-work by which it is secured. Indeed, larger dimensions are often a great advantage, and thus in some they are as much as from eighteen to twenty-two feet in length. These exceptionally large shafts, however, most frequently occur in the Hartz and Hungarian mines. In Belgium and other parts of the continent the shafts are polygonal, and have from ten to twenty sides, sixteen being the most common. In Mexico they are invariably eight or ten-sided, partly for convenience, and partly to enable them to work on each side the mule whims they use for the purpose of raising the material.

The New Seat of the Iron and Steel Manufactures.

ATTENTION is being directed to the great wealth which has lain so long untouched in the coal deposits of West Virginia and the iron-ores which fringe the edges of that coal-field. Several parties of capitalists, including some of the active iron manufacturers of Pennsylvania and Wales, have within a year, made close examinations of these deposits, and the result is large tracts of land, in the vicinity of Covington, Va., and in the Kanawha valley, West Virginia, where the coal is found suitable for smelting purposes, have passed into the hands of Northern men. It is asserted, by English iron-workers of thirty years experience, that, within a circuit of one hundred and twenty-five miles around the celebrated White Sulphur Springs of West Virginia, there is more iron-ore than in the whole of Great Britain. Moreover, the ore is most accessible, and, when the necessary railroads shall have been constructed, which will unite the ore and the fuel, and convey the metal to the markets of the world, there is no reason why iron should not be made anywhere along the line of the Chesapeake and Ohio railroad with less labor per ton than in any part of Europe. Similar testimony comes from the western edge of the West Virginia coal-fields, bordering on the Ohio and its tributary streams. Within a hundred miles from the mouth of the Kanawha river, the hills are seamed with iron-ore, and on the north bank of the Ohio are found veins of iron-ores. European capitalists have lately made large purchases in Southern Ohio, with a view to the extensive production of iron. The superiority, cheapness, and nearness, of the Kanawha varieties of coal, have been so far established as to cause a stir in the iron market. Pittsburgh, Cleveland, Toledo, Cincinnati, Louisville, Columbus and Richmond, are each of them pushing lines of railroad to the Kanawha coal-beds.

The following extract from a recent report of the Hon. H. Fisher, geologist and practical iron-worker of Pennsylvania, explains the great advantages of the coal-fields in West Virginia:

"There are five items that affect the value of a coal-field: 1. Quality of the coal; 2. Quantity; 3. Accessibility of the coal itself; 4. Market. The last, one of the most essential, will be given this region by the Chesapeake and Ohio railroad. The facts already stated have demonstrated its value in the first and second. In the third item, the most essential to cheap and profitable working, this region stands unrivaled. The chasm of the river Kanawha renders most peculiar service in its relation to the coal. Cutting all the coal strata for nearly its whole length entirely through, and getting down among the shales under the coal, the river has caused the numerous streams which pierce this whole coal region to cut down through most of the coal-bearing strata on their courses, leaving the coal entirely above the water level, accessible at hundreds of points by simply scraping off the surface-soil; so that so far as the mere getting of the coal is concerned, $2,000 will open a mine ready to ship one thousand tons per week. There is no region in the world where less physical labor will prepare a mine for the delivery of coal at the drift's mouth. This will be made clearer by a comparison of the position of coal here and in Great Britain in this respect. In Great Britain, and in fact in most all the European coal-fields, the coal is deep below the water level. To reach the seams requires the expenditure of years of labor and vast sums of money in sinking shafts or pits, and in erecting pumping and hoisting machinery, to be maintained and renewed at heavy annual expense. It is authoritatively stated that the cost of sinking shafts in the Newcastle region of England to the depth of 1,000 feet has been in many instances, $1,000 per yard. In the great northern coal-field of Great Britain, producing 20,000,000 tons per annum, there are 200 pits or shafts, costing, in first outlay for sinking and machinery, $50,000,000, to which must be added the necessary expense of constructing and maintaining proper air-courses and their accessories requisite to the safety of the employés. There is now invested, simply in pits and machinery for pumping and hoisting the 100,000,000 tons produced in Great Britain, $200,000,000, and this vast sum is destined to utter destruction in serving the purpose for which it was used. These pits and machinery being constructed, they involve a certain amount of labor for every ton of coal got, in addition to their cost and renewal. Now, in this great coal-field crossed by the Chesapeake and Ohio railroad, Nature has already sunk all the necessary pits and shafts, which need neither repair, renewal, or labor, to work them. The law of gravity has provided the most perfect, permanent, and costless pumping machinery, and the most perfect ventilation of the mines and safety of the employés, instead of requiring scientific knowledge and anxious thought, is simply a matter of the most ordinary care; the almost perfect freedom from noxious gases being the natural result of the position of the coal strata. With the facts now at hand, a fair consideration of the prospects of the line of the Chesapeake and Ohio railroad as an iron manufacturing center can be had. In this connection the following letter, which has been made public, is most pertinent as to the value of the Kanawha as an iron coal, and as giving the views of the leading Western iron men on this subject:

"OFFICE OF C. & C. MENDENHALL & CO., No. 27 VINE ST.
CINCINNATI, Oct. 10, 1867.

"To J. G. PAXTON, ESQ., LEXINGTON, VA.

"DEAR SIR: Your note making inquiry respecting the character of the Kanawha coal as a blast-furnace fuel is received. In reply, I may briefly say that we have thoroughly tested its quality for this purpose in our own furnace, near Wheeling, with the most satisfactory results, regarding it as better adapted to smelting iron than any known coal of the Alleghany field. We use the CAMPBELL'S Creek and Coalburgh coals with about equal results. The estimate in which our furnace manager holds these coals is evidenced by the fact that I am authorized to contract for a supply to be carried up the river to Wheeling, for use in our furnace there. An extensive acquaintance with nearly all parts of our Alleghany coal-fields justifies me in saying that I know of no coal equal to it in every respect; and there is no portion of the field so richly developed as on the waters of the great Kanawha, or where it can be brought into use at so cheap a rate. The coal in the Mahoning Valley, which is now used by the works of Gov. Todd and others there, has hitherto been regarded as of the finest quality known by the works which use it; but our founder, who has managed furnaces for many years in that valley, places the Kanawha coal unquestionably before it; and the extent to which the seams of that coal are developed, bear no comparison with the seams on the Kanawha, while the cost of mining the former must always be two or three times the cost of mining the latter. Since the trial of Kanawha coal by us, in April last, two furnaces of large size have been, or are about to be, commenced at Ironton, Ohio, designing to use it as fuel, and one near the city is also provided for, intending to use the Kanawha coal, Missouri Iron Mountain ore, and the limestones of this vicinity. A careful comparison of the cost of making pig metal with these materials in this place proves it to have a very decided advantage over any other iron district in the Ohio Valley—an advantage which cannot be superseded until you can, by a railroad to connect with the Virginia Central Railroad, (now Chesapeake and Ohio) or an improvement of the navigation of the New River, bring together the rich, brown hematite ores existing along that railroad and river, and the coals of the Kanawha, and also the limestone of the Greenbrier. I am informed that the brown hematite ores to which I refer can be mined and placed on the Virginia Central Railroad at a cost of about one dollar per tun; if so, by a reciprocity of freights between this district and the Kanawha coal region, this ore can be laid down at the Kanawha Salines for $3 per ton, or for a ton of iron $6; three-quarters of a ton of limestone from Greenbrier, $1 50, and 2½ tons of coal (70 bushels), at not over four cents a bushel, $2 80, making the total outside cost of materials per ton of iron, $10 30. These appear to me to be the highest cost for materials at the pre-

sent high prices of labor, and at less than half the cost of similar materials in the most favorable of the districts where iron is now made in the Ohio and Mississippi Valleys. Intelligent iron men have seen clearly, since the trial of the character of your coals, that if the materials I have referred to, are thus brought together, the Kanawha Valley and the ore region will be, at an early day, teeming hives of industry and wealth, and one of the most important centres of the iron manufacture of the United States must be in this portion of the interior of the State of Virginia.

"Yours, truly, CYRUS MENDENHALL."

Mr. FISHER then shows that coal, both for fuel and smelting purposes, can be put on the cars for $1 a ton, and delivered at the ore-banks for (say) $2 50 a ton anywhere along the line of the road; or the same cars can carry coal one way and return laden with ore, so as to build up furnaces at each end of the route, and so supply both the Eastern and Western markets. He thus shows that, in addition to the opportunities for establishing cotton and wollen manufactures in the Kanawha Valley, that region can furnish the United States with cheap iron and coal for a thousand years to come. As articles of iron require more work, such as locomotives, steam mills, finished iron-work of all descriptions, the manufacture of steel, etc., so do they represent more coal per ton of finished work, and can be manufactured proportionably cheaper, as fuel is cheaper. In Pennsylvania, the manufacture of charcoal iron is gradually dying out, owing to the want of proximity to the wood and ore. This proximity still exists over a large field of country in Virginia, and is transferring the manufacture of charcoal iron to this State. This article is essential to the production of good car-wheels and the manufacture of BESSEMER steel, and is now transported to Pennsylvania, to be there used for these purposes and worked up by a dear fuel. The laws of trade will only permit this so long as this Iron cannot meet its natural ally, the coal of Virginia. When this occurs, and rolling-mills have been erected to make the necessary axles and bar iron, and all brought into connection with the cheap and superior lumber of the coal region, the industry of freight and heavy car construction will be driven to seek the line of this road, and it will not be five years from its completion before four-fifths of this class of cars used in the United States can be here manufactured. Allusion should also be made to one peculiar facility, incident to this river, resulting from the deep chasm cut by the waters, and which certainly can be found at but few other points. It is the use that can be so easily made of cheap hydraulic means for the lifting and handling of heavy weights. To illustrate: At almost any point along the river, the mountain streams can be turned into pipes with heads, say of three hundred feet, giving a pressure at the railroad level of say one hundred and twenty-five pounds to the square inch. If you wish at any point to lift and handle weights of ten tons, you simply turn this water into a cylinder with a piston of eighteen inches, which will allow over thirty per cent for friction, and it will lift the ten tons and can be operated by any one who can turn a hydrant-cock. This plan can be adopted in hundreds of ways inexpensively, and with a saving of labor that in some instances amounts to a fair profit in itself. Again, it may be suggested, and with plausibility, that, while our statesmen and merchants are bemoaning the inability of our mechanics to build iron vessels in competition with the English, the solution of the difficulty may be found in some position on this road where, with a fuel that will cost in actual physical labor to get it, scarcely more than half of the cost of British coal, and a concentration at one point of the furnace, the rolling-mill, the foundry, the machine-shop, and the finishing-shop, a ship may be built to be delivered in ten, twenty, or even thirty ton sections to the seaboard, to be there simply tacked together and put afloat. Mr. HEWITT, our Commissioner to the Paris Exposition, says, "we are already making railroad iron in this country cheaper than anywhere else in the world, estimated in days' labor."—*Tribune.*

Steel and Steel-topped Rails.

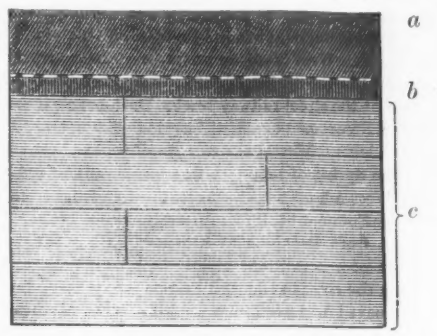
WE published last week an abstract of the report of the Massachusetts Commissioners, which establishes the general superiority of steel rails, and quotes, in regard to the relative economy of iron, steel, and steel-heads, the estimate of Mr. SANDBERG, that "where ordinary iron rails are worn out in five years or less, solid steel rails are most economical; where they last over ten, and up to fifteen years, steel-headed rails would be the cheapest; but if the iron rails will last from fifteen to twenty years or more, it is cheaper to use them."

Mr. SANDBERG's method of calculation is correct; but its results, as above set forth, require revision. In the first place, he estimates interest at five per cent., which is too little. In the second place, both the prices and the perfection of steel and steel-topped rails are not at the present time, and in this country, the same as when his discussion was published. The question has now become, between all steel and steel-topped rails, rather one of actual merit than of relative cost. The Massachusetts report indicates that some of the steel-headed rails on American roads are wearing as well as those wholly made of steel. For instance, the Connecticut River Railroad reports:

"In 1866 we laid down some thirty tons of steel-headed rails from the Rensselaer Works, of Troy, New York, which have worn very well, none of them having failed in the least, and all presenting, at this date, the same characteristics and appearance under service as the best all-steel rails."

It is evident, that for purposes of comparison, the kind of steel topped rails should be specified. Many kinds have been tried, and the manufacture has been brought to considerable perfection; but this has been achieved by bringing the cost practically up to that of all steel, as we shall show.

The most perfect weld obtained in this class of rails is that of ABSTERDAM, in which an iron skin is *cast* upon the steel head-piece, or rather a highly-carburized plate of iron is set in the mould, and steel enough for a rail-head cast upon one side of the plate. Both together are then rolled down to a head-piece in the rail-pile. The union of the steel and the carburized plate is absolutely perfect; and as the plate lies next to the iron of the pile, it, of course, welds to the iron as well as the different parts of the iron pile to one another, or even better. This construction is shown in the accompanying diagram,



in which *a* represents the cast steel head; *b*, the carburized iron slab, and *c* the iron pile.

This rail, however, costs as much to manufacture as all steel; and, consequently, it cannot compete with the latter unless it can be demonstrated to be absolutely superior.

Another excellent steel-headed rail is that manufactured under CHUBB'S patents. The rails made by JOHN A. GRISWOLD & Co., of Troy, and referred to in the reports of the Commissioners above quoted, were of this description. The accompanying

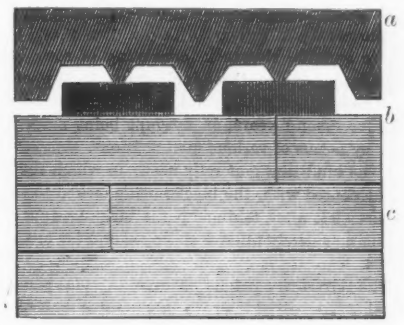


diagram sufficiently illustrates the construction, *a* being the steel head; *b*, the iron bars between head and pile; and *c* the pile. The excellence of these rails is confirmed by abundant testimony, but the question of cost is here also important. The CHUBB rail could perhaps be manufactured in large quantities, at five dollars to ten dollars per ton cheaper than all steel; but there is inevitable loss of many rails in the manufacture by overheating steel while getting the iron up to welding heat. Such wastage must either be determined at the works, by severe testing of the rails, in which case it would enhance the price, or it must come upon the purchaser, who takes the spoiled rails with the rest, in which case the quality and uniformity of the product, and its consequent reputation, are destroyed.

We are, therefore, on the whole, not surprised to learn that Messrs. GRISWOLD & Co., no longer manufacture steel-headed rails, but have devoted themselves entirely to the production of a first-class article of all steel. Their circular contains some interesting remarks on the manner in which they test their rails, and on the grades and tempers of their different varieties of steel, adapted to different purposes. To these we shall allude on a future occasion.

It is evident that, the proper rate of interest for calculation in this neighborhood being seven per cent., and scarcely less than that anywhere in the country, Mr. SANDBERG's estimates are not so favorable to steel as the facts; and the Commissioners themselves, while in a part of their report they have made a brief calculation, based on seven per cent., have assumed $120 per ton as the cost of steel rails, whereas the present price of Bessemer rails at the Troy works is but $100 to $105 per ton, currency.

But the great difficulty, after all, is to persuade our railroad companies to get good material of any kind. Steel is better, and, in the long run, more economical than the best iron; but even the best iron is far better than that which finds the readiest sale. Let our companies be once stimulated to prefer thorough work and true economy to quick profits and subsequent dilapidation, and the merits of steel, already acknowledged by engineers, will be enforced by public sentiment, to the great advantage of the public safety and wealth.

The Employment of Nitrate of Soda in the Metallurgical Treatment of Copper and Nickel.

PROF. RUDOLF WAGNER, of Wurzburg, has been engaged in experiments which seem to foreshadow an important innovation in the treatment of copper and nickel mattes and speiss. We find in the *Berg und Hüttenmännische Zeitung* an interesting report from his pen. The deductions from these experiments will be easily made by metallurgists, and we refrain, therefore, from all comment.

The employment of the nitrates of the alkalies in metallurgical operations has remained almost unknown up to within a few years previous to the present time. Only in the treatment of chrome-iron ores saltpetre had been used. But since attempts have been made in metallurgy, especially in the hydro-metallurgical beneficiation of the metals, to transfer into practice the teachings and experience of analytical chemistry, the important qualities of saltpetre have attracted attention in the metallurgical world; and it has been attempted to profit by them in the production of different metals. Great importance is already attached to the employment of nitrate of soda in the manufacture of steel and wrought iron from pig. Already in 1858, KNOBLES made propositions in this connection; and lately HEARGRAVES and HEATON have procured patents in England, which are founded on the employment of saltpetre in the transformation of pig iron into steel. HEATON'S process is endorsed by practice. It has been proved, that by this new process the best kinds of ductile iron and the most excellent steel can be produced even from such brands of pig as command a very low price in the market, and could not hitherto be used in the manufacture of steel on account of their inferior qualities; especially their contents of phosphorus and sulphur. HENRY BESSEMER, the well-known reformer in the history of steel-industry, has also taken in hand the principle of improving steel by means of saltpetre, and modifying his Bessemer-process of 1862, he employs the oxygen of the nitrate of soda instead of the atmospheric, for the decarbonization of fused pig-iron, and by this means, also, drives the phosphorus and sulphur of the pig into the slag in the form of phosphates and sulphates. According to notes collected by Prof. WAGNER, in August of last year, during a technological tour through the iron works along the river Maas, in the neighborhood of Liege, Belgium, the introduction of saltpetre in the treatment of iron marks, beyond doubt, a turning-point in the history of chemical metallurgy.

After it had been proved that, by means of melting saltpetre, carbon, sulphur, and phosphorus could be advantageously removed from pig iron, the thought necessarily occurred, that also in the metallurgical production of other metals, not from the ores, but from the intermediate products obtained in their manufacture, saltpetre might be profitably employed. Examples of the use of nitrate of soda for the refining and separation of certain metals are not rare in the laboratory of the analytical and manufacturing chemist. Long ago, a partial removal of the arsenic from antimony-regulus was effected by a dissolving smelting with saltpetre. At the present time, separation of arsenic from other metals by means of smelting such combinations with saltpetre and soda (for instance, in the analysis of pyrargyrite) as proposed by WOHLER, is still one of the best analytical methods of separation, and saltpetre remains one of the most important chemical reagents of the blow-pipe chemist, as it has been since the times of BERZELIUS and PLATTNER.

Since Chili saltpetre is exported to the amount of 350,000,000 pounds per annum from the South American ports of the west coast; while the imports of East India saltpetre into Europe increase by thousands of tons every year, the economic employment of saltpetre in the metallurgy of many metals may be expected to increase in extent, as metallurgical manipulations assume the character of chemical operations, and the by-products, which result from the use of saltpetre, acquire a market value for chemical preparations.

The crude saltpetre coming to Europe from the works in Peru contains generally only 90 per cent. of nitrate, and frequently from eight to ten per cent. of water. As an exact analysis of crude soda-saltpetre is wanting, Professor WAGNER submitted a sample, dried at 100° C., to chemical investigation. The analysis showed in one hundred parts:

Nitrate of soda	94.03
Nitrate of soda	0.31
Cloride of sodium	1.52
Chloride of potassium	0.64
Sulphate of soda	0.92
Iodate of soda (iodine 0.18 per cent.)*	0.29
Chloride of magnesium	0.96
Boracic acid	traces.
Water with small quantities of organic substances	1.96

In the experiments described below, however, a refined product was employed, which contained 98.6–99.2 per cent. of nitrate of soda.

I. EMPLOYMENT OF SALTPETRE FOR THE PRODUCTION OF NICKEL.

The experiments were made:

1. With a *concentrated matte*, obtained from nickeliferous and cupriferous pyrites. This product contained in 100 parts:

Nickel	25.32	Iron	10.53
Copper	37.65	Sulphur	26.45

2. With a *nickel-speiss* from the Erzgebirge of Saxony, which, in 100 parts, was composed of:

Nickel	48.20	Copper	1.93
Cobalt	1.63	Arsenic	42.08
Bismuth	2.44	Sulphur	3.07
Iron	0.65		
			100.00

The concentrated matte was freed from the greatest part of the iron by an oxidizing fusion under blast; and the resulting refined matte was, after pulverizing, smelted with 15 per cent. of equal parts of nitrate of soda and calcined soda. The resulting alloy of nickel and copper contained in 100 parts:

Nickel	90.67	Arsenic	0.62
Copper	4.05	Loss of substances not determined	0.36
Cobalt	0.30		
			100.00

From the mixture of alkali-salts occurring in the slag from this operation, the sulphate of soda can be obtained by lixiviation. Another experiment showed that also *all* the iron and sulphur could be removed from the concentrated matte by nitrate of soda. An excess of nitrate produced a nickeliferous slag; copper, on the contrary, was not carried into the slag even by a long-continued smelting with nitrate of soda.

The treatment of nickel-speiss of the above composition by roasting with coal, results, as well known, unsatisfactorily, so far as the removal of the arsenic is concerned. The transformation of the arsenic into volatile chloride of arsenic, from which arsenious acid may be precipitated by water, has often been attempted in a small way, but at present it is impracticable in metallurgical processes. A chloridizing roasting of

* NOTE.—The percentage of iodine in the crude Chili saltpetre is important. In Tarapaca about 30,000 lbs. of iodine are yearly produced from the mother-liquor resulting during the refining of saltpetre; and most of this quantity is exported to Europe.

the pulverized speiss, however, with tachydrite, carnallite or hydrated chloride of magnesium, in short, with all substances evolving hydrochloric acid at higher temperatures, must certainly be recommended to practical metallurgists. It may also be mentioned here, *en passant*, that from nickel-speiss alloyed with zinc the arsenic may be removed by means of superheated steam in the form of arseniuretted hydrogen. It is much more rational, however, to combine with the removal of the arsenic from nickel-speiss the production of arseniate of soda, a salt which is employed largely of late as a mordant in calico-printing, as a means of fixing the alumina and the oxide of iron, and as a substitute for "dunging."

Already in 1855, PATERA proposed to mix nickel-speiss intimately with fifteen per cent. of calcined soda and one per cent. of Chili-saltpetre, to heat the mixture in a reverberatory, and to lixiviate it afterwards with water, which dissolves arseniate of soda. It is strange that these propositions have never been realized at nickel works, although their execution gives good results, if the amount of saltpetre is increased so as to use for 100 parts of speiss from 3 to 5 parts of the nitrate.

When a mixture of pulverized nickel-speiss with five per cent. of nitrate of soda and ten per cent. of soda was smelted, all the arsenic was found in the slag as arseniate, and with it all the other injurious substances. The resulting regulus contained :

Nickel	40.93	Iron	0.25
Copper	58.64	Sulphur	0.18
			100.00

If, instead of the nitrate of soda, barium-saltpetre is used, or, still better, a mixture of both nitrates, the arsenic can probably be obtained in the form of arseniate of baryta, (insoluble in water) from which the arsenic acid can be isolated by means of sulphuric acid. The last remnants of arsenic, it seems, cannot be removed from nickel-speiss by nitrate of soda, even if the reaction is permitted to continue for a considerable time. The reason for this is the fact that from the arseniate mixed with the nitrate metallic arsenic is continually precipitated by the copper of the alloy. Sheet-copper dipped into melting saltpetre, to which a little arseniate had been added, was covered instantly with arsenic.

In executing this process on a large scale in a reverberatory, care must therefore be taken to avoid a perfect fusion of the dissolving mixture intended for the oxidation of the arsenic and iron ; and this can undoubtedly be accomplished by fluxes adapted for this purpose, such as carbonate of lime, or baryta.

Wooden Pavements.

A CHICAGO correspondent of the New York *Mail*, of recent date, says : Wooden-block pavement of various kinds now covers all our principal streets, and is being laid down at the rate of twenty miles or more a year. Ten years ago next Fall the first street was paved with it ; now we have forty-two miles of it, and nearly twenty miles (19 86-100) more are to be constructed during 1870.

THE FIRST STREET PAVED.

In 1856 about one hundred and sixty feet of NICOLSON pavement were laid in Wells street as an experiment, but there being some prejudice against wooden blocks no more was used for several years. In the Fall of 1859 Clark street, the great north and south business thoroughfare, was paved with NICOLSON from Lake to Polk street—a distance of about a mile, and here the pavement has had as thorough a test, perhaps, as it can have in any city—hardly excepting on Broadway. All the heavy travel of the South Division was at once turned upon it. Three great railroad freight depots and numerous manufactories were reached over it, and the street being narrower than Broadway the proportionate wear on a given area was greater. For five years it was the only paved street running north and south, and so the NICOLSON was subjected to the severest kind of test. It has stood the test better than could have been expected ; the blocks have fairly worn down in many places to the thickness—or thinness—of less than two inches, while very little signs of decay are exhibited. Although now in a very uneven condition, and in fact pretty thoroughly worn out, so that it ought to be relaid, it is even thus more comfortable to travel upon than the bouldered or stone-paved streets. It has been renewed in many places, and has a patched look, and the blocks are very much out of the original lines, but has done good service and deserves to be well spoken of.

LAKE STREET.

Very soon after Clark street was paved Lake street was similarly improved, the NICOLSON pavement being laid down in 1861 from Central Depot to the river, about one mile, at a cost of $22,600. This street is the great east and west thoroughfare, lined with wholesale and retail stores, and terminated on the east by a union depot in which three or four great railroads centre. All the heavy travel between the East and West divisions of the city was at once transferred to it. Within two or three years it has been relieved by the paving of two or three parallel streets, but is still a closely crowded thoroughfare. The pavement is worn and uneven, very much as that on Clark street, and will soon be renewed, but travel here is still much more agreeable and easy, than on unpaved streets.

ON OTHER STREETS.

During the war public improvements were mostly discontinued, but in 1865 they were recommenced with renewed vigor, and nearly twenty-five miles of wooden-block pavement were constructed upon most of the principal streets in the three divisions of the city. The names and characters of some of these streets and the age and present condition of the pavement will serve to illustrate. They are as follows : Wells street—subject to a good deal of heavy travel, freighting to and from depots, etc., paved in the Summer of 1865. Not much worn, but somewhat uneven. Wabash avenue—the principal thoroughfare for pleasure travel, and also subject to much heavy freighting, paved in the Fall of 1865, in general good condition, though uneven in some places—is still considered the finest drive in the city. South Water street—the great commission-house quarter, subjected to enormous wear from heavy trucks, paved in the Fall of 1865—is very much worn, but still comfortably passable. Van Buren street—much travelled to and from a principal depot and a river bridge, paved in the Summer of 1865—is in good condition. Franklin street—much used for freighting from manufactories, paved in the Fall of 1868—is in excellent condition. West Madison street—very heavy travel of all kinds ; paved in the Spring of 1866 ; in bad condition, sunken and spread at the street railway tracks (DEGOLYER'S patent, not the original NICOLSON pavement, of which latter little has recently been laid). West John street—subject to heavy travel ; paved in the Spring of 1866 ; in very bad condition, rough and uneven. West Adams street—travel mostly of light vehicles ; paved in the Summer of 1869 ; in excellent condition. North State street, from Michigan to Kinzie—paved in the Summer of 1865 ; in poor condition, mainly from wear. North Clark street, from the river to Chicago avenue—very heavy travel of all kinds ; paved in the Summer of 1867 ; in bad condition, uneven, worn and spread from the street railway tracks. Pine street—mainly carriage travel ; paved in the Summer of 1869 ; in excellent condition. These will serve for examples, showing that some of the paving has withstood very severe travel for ten years ; other portions have become uneven and badly worn in five years, and others of the same age and with about the same amount of service are still in good condition ; while that laid one and two years ago is all in good condition.

THE KINDS OF PAVEMENT USED.

Although all the wooden-block pavement is popularly known as the NICOLSON, there are no less than six varieties of it use here, as follows :

First. The genuine NICOLSON, consisting of rows of blocks fastened at the bottom to three-inch strips, the upper portion of the cells being filled with gravel and tar. None of this has been used for several years, an attempt being made to avoid the royalty by means of various modifications.

Second. The kind now generally used, in which the wooden strips are dispensed with, the blocks being tacked to the floor, and the spaces left after taking up the strip used for keeping distances, being entirely filled with gravel and tar to the depth of six inches.

Third. The BOYINGTON patent pavement. The peculiarities of this are that one-half of the rows of the three-inch blocks are seven inches deep, (instead of six, as usual,) resting on the ordinary flooring of inch boards, while the alternate rows of the usual depth of six inches, rest on the centre of strips of inch boards, five inches wide, placed crosswise of the flooring. These strips touch against the seven-inch rows, and are nailed to the flooring. There are thus formed, between the six and seven-inch rows, cells six inches deep and one inch wide, extending across the street. As respects the gravel in the cells and on the surface and the use of tar, the pavement does not differ from the ordinary mode as described heretofore.

Fourth. The CONVERSE wooden pavement. This differs from the others mainly in that the cells which, in the other modes, are occupied wholly or in part with gravel and tar, are here dispensed with, the space between the rows of blocks being occupied with strips of inch boards of the same height as the blocks, set up edge-wise.

Fifth. The NELSON pavement, in which the blocks are much larger than in the other kinds, having a surface of perhaps 8 by 12 inches, and are placed directly upon the ground without flooring, a thin section being cut from the side of each—part away from the top—leaving a cell in which gravel and tar are poured. This has been tried but little as yet. The advantage claimed is that it can easily be taken up for repairs or for putting down water-pipes, etc., without involving the necessity of cutting the flooring, as with others. It is doubted, by some, whether on our soil at least, the blocks will not become uneven.

Sixth. The STOW pavement. This has been in use in San Francisco and elsewhere, but has not been tested here. A small section of Lake street is now being laid with it. Its peculiarities are these : A row of blocks of the usual size is laid upon the ground, and then a row of pieces of inch board, six of eight inches wide and six inches long, and sharpened at one end, is laid close against the blocks. Alternate rows of blocks and bits of board are thus laid, and then the boards are driven down about three inches by means of sledges and iron punches, and the spaces filled in with tar. These stakes or wedges are expected to hold the blocks firmly in position. No flooring or nails are used. The ground is not rolled or made hard in any way, but simply levelled, and it seems doubtful if the blocks will remain with even surfaces.

THE FOUNDATION.

It has been abundantly proved that wooden blocks, properly laid, will withstand long years of the hardest kind of travel. The important point is that they be supported by a firm, even foundation, and this is where our pavements often fail. Very little cutting is done in this city in preparing streets—the work is almost entirely in filling, and hence the foundation is likely to be unsubstantial, the work of paving being hurried forward immediately after the filling, and before the earth has packed. Not unfrequently, too, manure and street rubbish are contributed towards the filling, so that a considerable settling follows. When the foundation is solid, however, the pavement lasts well. The general rule is to cover the earth with four inches of sand, which is smoothed over and covered with the flooring. This generally consists of but one thickness of boards, though in some cases two courses have been tried without much evident benefit, it is thought. A foundation of concrete has been proposed but not tried. Such a foundation, or one of broken stone would undoubtedly add much to the solidity of the pavement as well as to its expensiveness.

THE NICOLSON ROYALTY QUESTION.

In 1862, before the pavement had been laid, except on Clark street and the little patch on Wells street, already mentioned, the city authorities refused to pay Mr. NICOLSON the royalty fee, on the ground that a similar pavement had been patented and used in England a number of years before he obtained his patent. NICOLSON sued the corporation and obtained judgment against them. They appealed to the Supreme Court of Illinois, but were again defeated, and again appealed to the United States Supreme Court, where the case was contested for several years. Meantime several changes were made in the character of the pavement by different inventors, who obtained patents for their improvements, and a large amount of pavement was laid, it being thought that NICOLSON'S claim for royalty was thus evaded. Finally, however, it was decided to settle the matter, and last year it was agreed to pay the assignees of Mr. NICOLSON $52,000 as royalty on the twenty-one miles of wooden block pavement laid last year, and $17,000 for all that laid between 1864 and 1869, and to pay ten cents per yard for all to be hereafter constructed.

OFFICIAL STATEMENT.

In response to a request made at the office of the Board of Public Works, on behalf of the *Evening Mail*, for information concerning the amount of pavement laid in Chicago and the estimation in which it is held, the following has been furnished :

OFFICE OF THE BOARD OF PUBLIC WORKS,
Nos. 15 and 17 WELLS STREET, CHICAGO, May 25, 1870.

In the year 1856, the first Nicolson pavement was laid in this city, upon Wells street, between Lake street and the Wells street bridge. It was subjected to a heavy wear, and had to be renewed in 1866, after ten years' use. It is calculated that, with ordinary wear, a wooden block pavement, well laid, will last from twelve to fifteen years.

Various kinds of pavement have been tried here, but none have given so good satisfaction as the "wooden block," when all the advantages and disadvantages are considered.

The kind of wooden block pavement generally adopted here is the pine flooring and six-inch blocks without strips, the inch space between the blocks being filled with gravel and tar.

We have about forty miles of wooden block pavement now laid, and shall lay during the coming season nineteen and one-half miles in addition. * * * * * * * *

F. H. BAILEY,
In charge of Assessment Department.

THE DEFECTS OF WOODEN BLOCK PAVEMENT.

The principal, and about the only, argument urged here against this pavement is, that on several streets it has become very uneven, so that long before it is worn perceptibly it is in bad condition for travel. This difficulty arises from imperfect foundations and gross carelessness in laying. The city has an inspector to oversee each job of paving, but he is too apt to be negligent and allow the contractors to hurry it through in their own way ; and the contractors, interested only in getting the pavement down and receiving their pay, are too apt to leave the work to poor workmen, or to use bad and poorly packed material for the filling or thin boards for the foundation. In time the boards rot or break down over the depressions in filling, causing the sunken spots which are so ruinous to the pavement. In many cases, too, portions of the pavement have been taken up to allow the laying of gas or water pipes, the earth then being hastily shovelled back and not packed by being mixed with water. The blocks, being relaid, never have their original evenness and solidity, and the street assumes a patched appearance, and has to be repaved long before the blocks are worn out. This latter serious difficulty, however, has been obviated, as no streets are now paved until water and gas pipes are laid for each lot.

ITS ADVANTAGES.

The advantages of the wooden block pavement over all other kinds tried here—macadamizing, gravelling, cinders, boulders, and stone blocks—are so many that it is universally popular. It is smooth, noiseless, not slippery, handsome, and easily cleaned. The moment it is laid on a given street, the value of property fronting it is immensely appreciated—sometimes doubled in a short time—especially in neighborhoods very undesirable and little frequented. So well is this understood that property-holders are generally not only willing but anxious to have their streets paved, although the expense is assessed directly upon them, and required to be met in a single payment before the work is begun. PENCIL.

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, May 26, 1870, Professor S. D. TILLMAN in the Chair.

THE meeting was opened by a paper from Dr. FEUCHTWANGER, upon "The Origin of the Alkalies in Soluble Glass," which will be published next week. The President then gave the latest theory of the formulas for soda and potash.

New inventions being the next item in the programme, Mr. NIMMO presented a specimen of a new cast-steel bit for pick-axes. After being cast into a shape nearly like that which it is to have, the ingot is drawn out under the hammer to the required shape.

Mr. WIARD said it was quite remarkable that people would decarbonize cast-iron, when, by not carrying the process quite so far, they could have a stronger metal, while it costs less to make it and takes less fuel.

Dr. BRADLEY thought the new picks were in form particularly favorable for strength. They are much cheaper than forged steel, and will cost the public ten or twelve cents per pound.

Mr. WIARD explained that there was some objection in the public mind to the use of steel in rails, castings, etc., on account of cracks. By proper care in casting and forging, he thought this might be avoided.

An improvement upon the Bunsen burner was then described. It consists in putting over the flame a wire gauze, which, by retaining the heat, enables one to keep up a very

small flame with a little flow of gas. In the ordinary Bunsen burner, a large quantity of gas must be consumed for even a slight heat.

Mr. JAMES CUMMINGS presented a new gauge-cock, which not only takes the place of the ordinary gauge-cocks, but answers for a glass gauge as well. It consists of a bent tube of some length passing through a stuffing-box into the boiler. Outside it terminates in an ordinary cock. Attached to the tube is a pointer, which indicates precisely the position of the mouth of the tube; by turning the tube upward or downward, it is possible to find the water-level, if it is anywhere within two feet of the highest point.

Mr. WIARD said this would be a useful form of water-gauge where the water was lifted up by steam below it, as the tube could be turned down into the steam, and even down to the lower water-level.

Dr. BRADLEY said that the water is only lifted out of the water spaces when the engine is running, which is a useful fact, as it enabled the engineer to ascertain the true condition of the water by merely testing the gauge, stopping the engine, and testing again.

Mr. MONTGOMERY was greatly in favor of a float-gauge, as giving, in his opinion, as reliable indications as could be obtained.

Dr. BRADLEY said floats were the invention of forty years ago, and had gone out of fashion.

Some little time was then taken up in further discussing points connected with floats, guages, etc., when the discussion of Mr. WIARD'S article upon "The Ship of the Future," was taken up.

Mr. MONTGOMERY, after some preliminary remarks upon the greater strength of iron over wood, spoke of the immense strength of the first iron ship, the "Great Britain," which went ashore, and was exposed for ten months to the pounding of the sea coming unobstructed from the Atlantic. The vessel is now afloat, in service, and apparently as strong as ever. The "Great Eastern" is called a humbug. People ask us if we cannot build ships so that they cannot sink; and yet this same ship—this humbug—lay in Flushing bay for some months with a hole in her bottom ninety feet by ten; but she did not know enough to sink. The troop ship "Sarah Sands," an iron ship, bound from England to India, took fire, had her whole stern burned out, and then carried her crew and 1,500 men into a port over 1,700 miles distant. LARDNER said of ships, built as they were then, that they would not pay—and they do not; but he did say that if ships should be built of iron, and driven by a screw, and not by paddles, then they would pay; and they do. If we want a merchant marine, we must go to work.

The President remarked that it is not at all necessary that we have a merchant marine. Our own inland commerce is now greater than all England's marine; why should we not allow her some liberty? It was about the only thing she had now. We built monitors, and they are comparatively useless compared with English ships of iron.

Mr. WIARD mentioned the holes in the bottom of the "Great Eastern," and thought that, had she been at sea, she would have gone to the bottom from bending. As it was, she lay in still water. He did not think there was any rock concerned in making the hole in her bottom; nobody saw any or felt any shock.

A lively discussion then took place upon the strength of iron to withstand various strains. As no one could settle the matter definitely, very little of real value was elicited on the subject.

Mr. WIARD held that the strains to which a vessel is subjected when supported in the centre by a wave and suddenly undergoing a change of temperature, are greater than the tensile strength of the plates.

Mr. MONTGOMERY said that, practically, a vessel's skin would be of the same temperature of the water in which she floats. The inner skin and bulk-heads would be much higher in temperature, having that of the air in the hold; but the elasticity of the plates would more than make up for the unequal expansion, so that practically it would be of no importance. It is even possible to draw water cool enough to drink from boilers with one hundred and ten pounds steam pressure in them, showing an enormous difference of temperature in them; yet they did not burst.

The discussion then became brisk, and turned upon questions which can only be decided by careful observations and experiments upon shipboard.

Mr. FISHER took exception to the idea that the hole in the "Great Eastern's" bottom was the result of unequal expansion. He thought the facts in the case would not bear out the statement.

Mr. WIARD, in proof of his idea, adduced the fact of the monitor's decks breaking away from the overhang, and the vessel sinking at once.

Mr. FISHER would hardly admit this as a parallel case.

After the reading of the items of scientific news, which we print on another page, the Club adjourned for its summer vacation.

Mining and Reduction in Mexico.

TO THE EDITOR: Sir—I have just finished reading WARD'S "Mexico," and take the liberty of recalling to your attention a few extracts from it:

"RESCATADOR.—This word signifies in Spanish 'one who buys ores (at the mine), and reduces them at his own mill (hacienda de patio) or furnaces (reduction works).'"

It is equivalent to "mill man" in the United States.

* * * * * * * * *

"The extraction of this mass of silver (£90,000,000 in fifteen years to 1820) was not due alone to the mine-owners and the Government. Few of the old mine-owners were capitalists, and the majority were compelled to carry on their mining by converting their first fruits into ready money. This led to the establishment of the class of men called *rescatadores*, who, being small capitalists, had recourse to the opulent merchants.

"These merchants advanced money to the millmen upon receiving a portion of the profits, and by this method the poor miner was enabled to realize immediately, while the merchants invested without fear of loss.

"The mines made rapid progress, and this system was carried to an enormous extent previous to the Revolution of 1820, all classes being interested directly or indirectly in the success of the mines.

"It gave an impulse to mining, unprecedented in history, and, as the poor 'prospectors' (requiring but a small advance to fit out for a prospect) spread out on all sides, making new discoveries, it is probable that had the Revolution of 1820 not occurred, that of the yield the mines of Mexico (at the present date, 1827) would have been double that of the richest year before it.

"As it was, this important link of the chain of communication between the highest and lowest classes of the mining community was completely destroyed.

"Their works could easily have been replaced, but the general insecurity led to the gradual dissolution of this system, which it had taken three centuries to bring to the state of perfection in which it had existed at the beginning of the war for independence."

WARD, in speaking of the cause of failure of several English companies, says:

"Had these *rescatadores* been in existence in 1825, they could have realized immediately; but the entire destruction of this useful class of men threw them entirely upon their own resources, and so much money was needed for 'dead work,' that upon a demand for more to erect large mills, the shareholders abandoned the enterprise at the point where their labor was about to be crowned with success."

This article is worthy of being carefully studied by the mining community of the United States. C. B. D.

MINING SUMMARY.

Idaho.

THE MINES OF OWYHEE DISTRICT.

Many of the mines around Silver City are, according to the latest accounts, doing finely. The lower stopes of the Golden Chariot, says the *Avalanche*, May 7, are yielding ore exceedingly rich, the best of which is being put up in sacks to prevent a waste of mineral. There is, at present, over 200 tons in the shute. The Ida Elmore shute is also full of rich ore waiting to be transported to the mill. Splendid rock is being taken from the lower level. The Baxter, under the manipulation of Wilford, France & Co., is yielding specimens of silver ore, beautifully studded with ruby silver interspersed with the crystallized mineral. Mr. Peck has struck a rich chimney in the Potosi. The quartz is of a light color, and completely matted with gold. High water prevents placer mining to advantage in the creek, but is being prosecuted with vigor in Blue, Jacobs, Slaughter House and other gulches.

FLINT DISTRICT.

A party who recently arrived at Silver City from this district brought over quite a snug amount of bullion, the product of Leviathan ore worked in Black's mill. We understand the yield was about $150 per ton. The mill is now running on Astor rock, and will soon commence crushing Pioneer, owned by Squire, King & Co. The Rising Star Company is expected to begin operations before long. The snow has nearly all disappeared, and the weather is lovely.

RICH PLACERS ON BOISE RIVER.

The Boise *Statesman*, May 10, notes the discovery, by Messrs. Montgomery, Alexander, and Gibbs, who have been prospecting on Boise river all winter, of a rich gulch about ten miles above town, near Sheep creek, which prospects from twenty-five to fifty to the pan, coarse gold. There are several other gulches near by that also prospect rich. Nine hundred dollars have been taken out of the Discovery claim. These new mines are said to be extensive.

THE WILLOW CREEK MINES.

Discouraging reports reach us from the Willow creek mines. The *Chronicle* is informed of a break in the big ditch, which the miners think will not be repaired in time for this summer's work. But few men are at work on the "break," and it is thought to be a "bluff" against the Eastern Company, who propose to buy the ditch and give the miners a show for working their ground. The miners, generally, are not doing anything on account of having no water. This was on Clark's creek. Everything is in a disorganized state, and the ditch monopoly seems to control the entire country.

Montana.

SCARCITY OF MINERS—MORE MEN WANTED.

All over Madison county, both in the agricultural and mining districts, says the *Capital Times*, the scarcity of working men is felt to be a serious drawback to the successful working of farms and placer and quartz mines. At no time in the history of Montana has it been found so difficult to procure laborers as at present. The classes most needed are the skilled artisan, the miner and the tiller of the soil, and, in fact, every one who is able and willing to work. The wages of good mechanics range from $5 to $8 per day; farm hands $4 to $5, and miners, $5 to $7.

The Helena *Gazette* says: "There are no idle men in Helena who want to work, and, on the contrary, miners are scarce and the demand brisk. Nearly all the mills at Unionville are lying idle for want of miners who have stampeded to Cedar, and claim owners on Last Chance and other gulches are now looking for men to hire. Mr. Jas. Halford, who is about to start in on his Basin creek mines, informed us the other day that he had hard work to get up his complement of miners, and other extensive miners have given us similar information." The Deer Lodge *New North-West*, April 15th, says: "Laborers are in demand at Silver Bow at $5 and $6 per day, and ditto at Pilgrim Bar and Gold creek."

THE CROW CREEK MINES.

These mines, situated within a few miles from Helena, are reported by the *Herald* as yielding good pay. Two mills are being built in Keating Gulch, the lower one by Keating & Blacker, 15-stamp, which they expect will be ready to run by the 16th of June. At that time they expect to have out 2,000 tons of rock, and already have out 1,500 tons of rock. On the Keating lead they are down 170 feet, with better rock, than they had above. On the Leviathan they are down 130 feet. They have worked 400 tons of rock from these leads, during last summer and fall, which averaged, he says, from $25 to $119 to the ton in an arastra. Mr. Quinn, the great ditch man, has just completed a branch ditch leading into Keating Gulch, which will carry 300 inches of water, for which he has an interest in Keating & Blacker's placer diggings. In a few weeks, he says, we may expect to hear big reports, in placer mining as well as quartz, from that vicinity. Wages are high and men scarce. Water is abundant. Raymond & Palmer, the owners of the new ditch, are selling all their water except what they need for their own use. They are working ground one mile below the town, and almost down into the Missouri bottom. They are making from $10 to $20 per day to the man, and here are hundreds of acres of the same ground that may be taken up. There are a number of other leads—the Ohio, Robert E. Lee and the Ironclad, which prospect well, and rock is being taken out in anticipation of the completion of the mills.

Colorado.

THE LABOR QUESTION.

The mine owners of Colorado are complaining of the high price of labor. They contend that they cannot pay from $18 to $21 per week and make a profit. "They may be right about this, but (says the Central City *Herald*) it is not fair to ask the miner to take less for his labor while the price of living continues at its present high figure. When a laborer pays from $8 to $9 per week for board out of his $18 or $21 wages, he has only ten or twelve dollars left, and out of that he must deduct his contingent expenses, which leaves a very small margin to save. Mine owners ought to co-operate for the purpose of reducing the price of board. If the miners can live for $5 per week, they can afford to work for $2 50 per day. Mine owners could build good, comfortable boarding-houses, and board their hands for $5 per week and make a profit. One man alone might not be able to do this, but by combining there would be no trouble in accomplishing it. We know of some men who intend to act on this plan at once, and we have not a doubt that success will crown their efforts. Cheap boarding-houses is what we want just now more than anything else. The display of a little public spirit among our mine owners will give us cheap living, and consequently cheaper labor and larger profits for mining. No sensible miner will object to a fair reduction of his wages, if at the same time he can curtail his own expenses. It is true, notwithstanding the high prices heretofore imposed upon the miners, they have made all the money, whilst the mine owner made none. If any one doubts this he has only to examine the standing of the two classes at the banks. The miners are about $200,000 ahead—the mine owners as far behind as their indulgent creditors would permit them to go. Mine owners have been working for grandeur—the miners have been working for money, and have saved it by economy practiced in every way possible. A reduction of wages, and a corresponding reduction of the miners' necessary expenses, would still enable them, by the same course of economy, to save and lay by an equal amount, as heretofore. Nor are we prepared to say that it is fair to compel the reduction of wages until measures are taken to make a like reduction in the miner's personal expenses."

MINING ITEMS.

The *Herald* has the following: "Mr. Valentine is taking out rich surface quartz from an old discovery near the Coroden mine. There are four companies of gulch miners prospecting for gold on north Clear creek, above Hill's works. Work has been resumed on the La Croose tunnel. This is the longest tunnel in Colorado—seven hundred and ninety feet. Ore from the Grass Valley claim, on the Prize lode, is yielding nine ounces per cord. The company expect to take out one hundred cords of ore during the month of June. John Q. A. Rollins is going to start up his big mill on South Boulder in a few days. It is 70x99 feet in dimensions, and is the most peculiar mill we ever saw. The machinery is positively marvelous, and past our power of description. One machine for pulverizing we may mention; it is a large, hollow globe of iron, with a solid ball of iron weighing six thousand pounds, which is made to roll around by the oscillating motion of the machine. It looks as if it might grind the hardest adamant to powder in less than no time. The mill, which is built like a pair of stairs on the side of a hill, is full of such things; not to mention twenty stamps and a splendid 60-horse power engine. A large quantity of ore is already broken for treatment, which is said to be very rich. Everett & Adams are putting in battery coppers at the Rochdale mill, and will start up again next week. This mill contains ten stamps, double issue, and is California rigged throughout—is run at the rate of eighty drops per minute, which can be increased to ninety. Four or five cords can be crushed every twenty-four hours. Cost of crushing surface ore, $20; iron, $25. The owners have not been disappointed in the working of the mill, which has demonstrated itself as a success. So far, the mill has been run mostly on surface ore. Mr. F. B. Gilbert, who has leased the Syracuse mill just above the Edwards house, reports the discovery of a very promising lode. This lode is situated on Turkey creek, just back of the mill, and efforts for its discovery have been made, more or less connectedly, for the last four years. The float is abundant and very rich, and lured on by such promises, prospectors have covered the whole hill with rifle pits. In imitation of great men, Mr. Gilbert has dug a Dutch Cap canal, but in such a way that the water runs only one way, and at last has discovered this, the last the latest, and the biggest thing in Colorado. The ore closely resembles that from the Coyote lode, and is found in great abundance. We understand that Jack Baker has offered to contract with the lessees of the Fairmount mill, Hukill gulch, for the treatment of two hundred tons of ore from the Shaffter lode. A test run in this mill upon several tons of this ore gave a yield of about two and a half ounces of bullion per ton, principally gold."

The *Register* says: "Mr. Adams, of the Rochdale mill, informs us that his California stamper crushes from three to four cords of ore per day as its regular rations. And that the silver-plated copper plates in use there have at least this advantage over any ordinary plates, namely: that they do as good work the first day as at any time, and they are always in good order. Four companies are working placer mines on Russel gulch below the mouth of Illinois: Henderson & Co., Scobe & Co., Richard White, and the Pleasant Valley Company, of which Mr. Alf. Owens is superintendent. The latter company are working a large force. Mr. Charles A. Hoyt has organized a company in Boston, Massachusetts, and will soon commence work on the Cashier lode. This has been proven to be the eastern extension of the Terrible, shows well, and has yielded satisfactorily in working tests."

BUSINESS AND PERSONAL.

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